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Linear Rail System

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SBG Standard Linear Rail System / SPG, SPS Spacer Linear Rail System /
Miniature Linear Rail System / SBC-ROSA Roller Linear Rail System

Technical Data

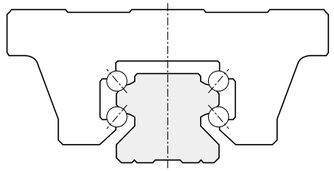
SBC LINEAR RAIL SYSTEM FEATURES

- Circular-Arc raceway structure achieves the high rigidity and large permissible load.
- Four row circular arc groove with 2 points contact creates the same load in all directions.
- DF structure maintains low instrumental errors.
- Low frictional coefficient achieves the high energy efficiency.
- Easy maintenance.
- Improve the productivity of the machine.
- Various options, Easy machine design and Longer life span.

Comparison the Linear Rail System with others

Item	Linear Rail System	Plane Ball System	Sliding Friction Guide
Assembly	Self-adjusting	△	Additional working need
Precision	Absorbing errors	X	Machining necessary
Maintenance	Various grease feeding	○	Hard to grease feeding
Sway	○	○	X
Impact	○	Low rating load	○
Moment	High rating load	Low rating load	Vulnerable to eccentric load

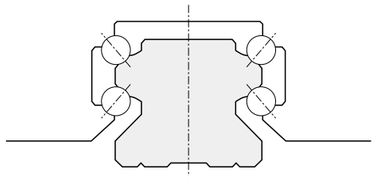
Technical Data



DF Structure

DF structure maintains low instrumental errors.

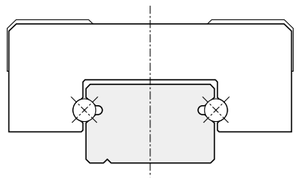
Applied model : SBI, SBG, SBS, SPG, SPS



The Structure of Raceway Groove and Ball Contact

Circular-Arc Groove, Four Raceway, Two-Point Contact Structure absorb the instrumental errors and create smooth movement even under high load operation.

Applied Model : SBI, SBG, SBS, SPG, SPS



Gothic-Arch Groove, Two Row, Four Point Contact Structure is not effective for absorbing errors but it is optimized for miniaturized machine which is necessary for smooth movement under high load condition.

Applied Model: SBM, SBML, SBMW

Technical Data

Load Rating & Life

Under normal conditions, the linear rail system can be damaged by metal fatigue as the result of repeated stress. The repeated stress causes flaking of the raceways and steel balls. The life of linear rail system is defined as the total travel distance that the linear rail system travels until flaking occurs.

Nominal Life : L (km)

We define the nominal life as the total distance of travel (L=km) without flaking by 90% of a group of an identical group of linear rail systems operating under the same condition.

[In case of ball]

$$L = \left(\frac{C}{P}\right)^3 X\ 50km$$

- L : Nominal life
- P : Pay load
- C : Basic dynamic load rating

[In case of roller]

$$L = \left(\frac{C}{P}\right)^{\frac{10}{3}} X\ 100km$$

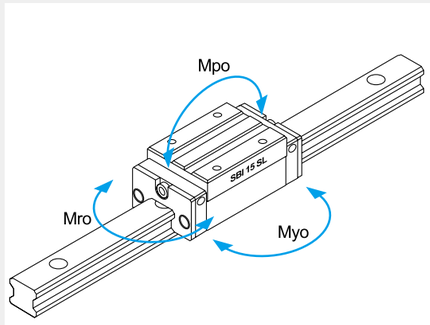
Basic Dynamic Load Rating : C (kN)

The basic dynamic load rating C is a statistical number and it is based on 90% of the bearings surviving 50Km of travel carrying the full load.

Basic Static Load Rating : Co (kN)

If an excessive load or shock is applied to the linear rail system in the static or dynamic state, permanent but local deformation can occur to the steel balls and raceway. The Basic Static Load Rating is the maximum load the bearing can accept without affecting the dynamic life. This value is usually associated with a permanent deformation of the race way surface of 0.0001 time the ball diameter

Technical Data



Static Permissible Moment : Mo (kN.m)

These load are maximum moments or torque loads that can be applied to the bearing without damaging the bearing or affecting subsequent dynamic life.

- Mro : Moment in rolling direction
- Mpo : Moment in pitching direction
- Myo : Moment in yawing direction

Static Safety Factor : fs

When calculating a load exerted on the linear rail system, both mean load and maximum load need to be considered. Reciprocating machines create moment of inertia. When selecting the right linear rail system, consider all of the loads.

$$f_S = \frac{C_O}{P} \quad \text{(Radial Load)}$$

$$f_S = \frac{M_O}{M} \quad \text{(Moment Load)}$$

- Co : Basic Static Load Rating
- P : Pay Load
- Mo : Static Permissible Moment (Mpo, Mro, Myo)
- M : Pay Load Moment

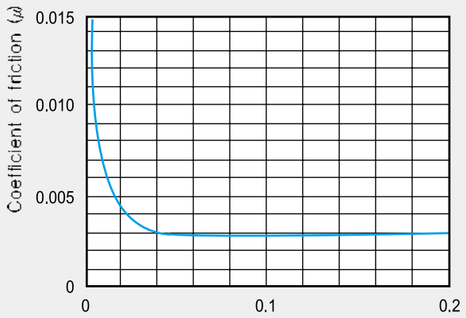
(Table, Static Safety Factor)

Operating	Load conditions	fs
Normally stationary	Impact load or machine deflection is small	1.0 ~ 1.3
	Impact or twisting load is applied	2.0 ~ 3.0
Normally moving	Normal load is exerted or machine deflection is small	1.0 ~ 1.5
	Impact or twisting load is applied	2.5 ~ 7.0

Frictional Resistance

The static and dynamic coefficient of friction of the SBC linear rail systems are so small that they minimize the required driving force and temperature increase. Frictional force depends on load, preload, velocity and lubrication. In general, the light load with high speed is more affected by the lubricant, while the medium or heavy load are more affected by the load and are less sensitive to lubrication selection.

*Coefficient of friction for linear rail system(μ) : 0.002~0.004



P : Load

C : Basic dynamic load rating

(Relationship between pay load and coefficient of friction)

Calculate comparison by different guide system

$F = \mu \cdot P$

- F : Frictional force
- μ : Coefficient of friction
- P : Load

(1) Linear rail system

P : 5000N

μ : 0.003

F = 0.003 x 5000N = **15N**

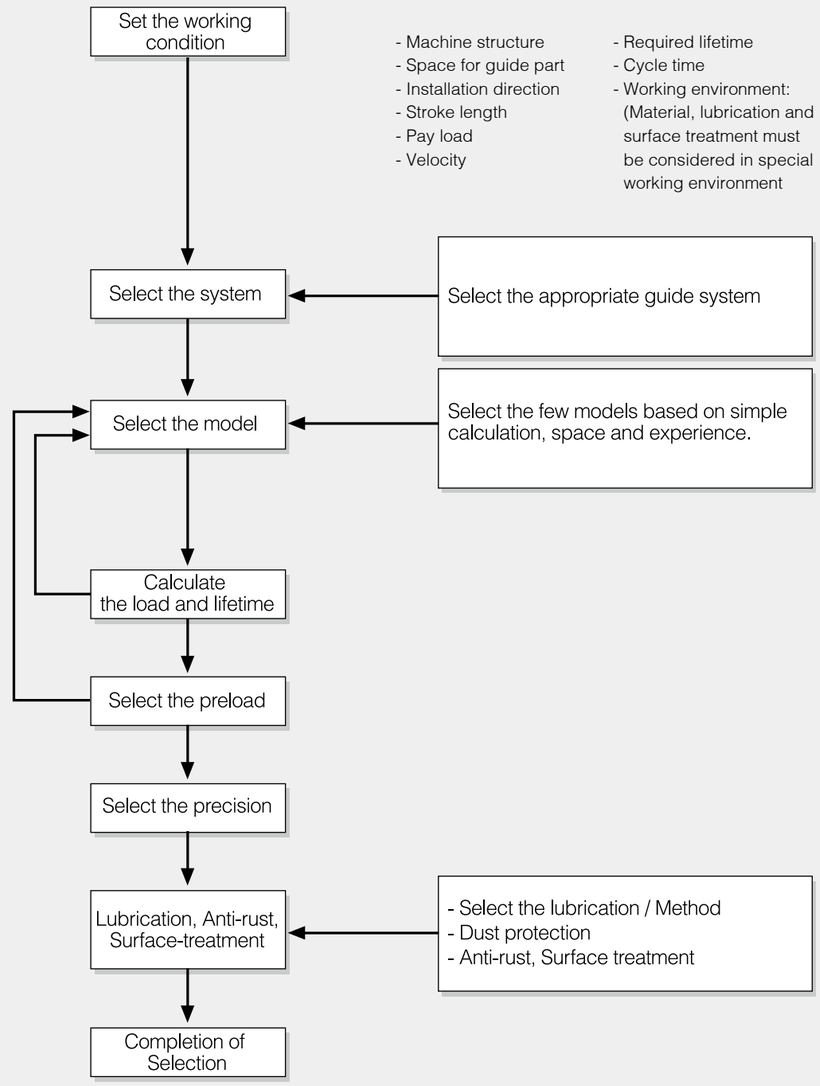
(2) Sliding linear rail system

P : 5000N

μ : 0.2

F = 0.2 x 5000N = **1000N**

The procedure of selecting linear rail system



Select the system / Model

1. Select System

Select the appropriate guide system after considering rigidity, cost of machine and manufacturing time.

2. Select Model

Select the few models based on simple calculation, space and experience.

3. Calculate the load and life time

Judge the expected life time after calculating the load and life time and apply the model to machine design.

3-1. Calculating the applied loads

Loads exerted on a linear rail system vary according to direction. It is important to consider this condition before selecting the type of linear rail systems and model. Refer to the below example when calculating the loads.

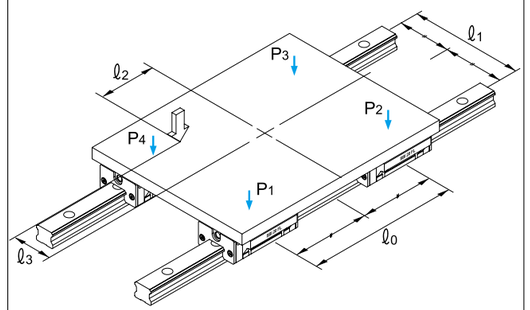
[Condition of calculating the applied load]

Select the few models after considering space and experience and simple calculation for working conditions.

- m (kg) : Load
- ℓ_n (mm) : Distance(mm)
- P_n : Radial load
- P_{nT} : Lateral load
- g (m/s²) : Gravitational acceleration (= 9.8 m/s²)
- V (m/s) : Velocity
- an (m/s²) : Acceleration

Calculating the applied loads and life time

Condition 1 Horizontal axis



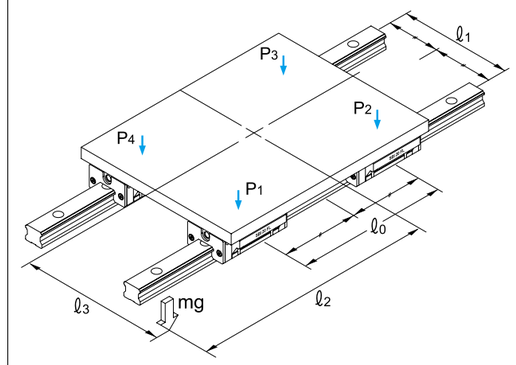
$$P_1 = \frac{mg}{4} + \frac{mg\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

$$P_2 = \frac{mg}{4} - \frac{mg\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\ell_3}{2\cdot\ell}$$

$$P_3 = \frac{mg}{4} - \frac{mg\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

$$P_4 = \frac{mg}{4} + \frac{mg\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

Condition 2 Horizontal axis with overhung



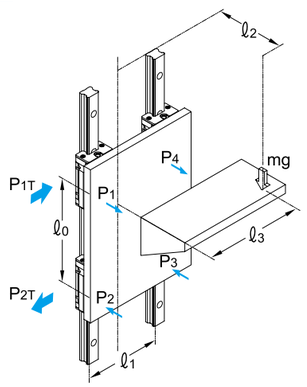
$$P_1 = \frac{mg}{4} + \frac{mg\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

$$P_2 = \frac{mg}{4} - \frac{mg\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\ell_3}{2\cdot\ell}$$

$$P_3 = \frac{mg}{4} - \frac{mg\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

$$P_4 = \frac{mg}{4} + \frac{mg\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\ell_3}{2\cdot\ell_1}$$

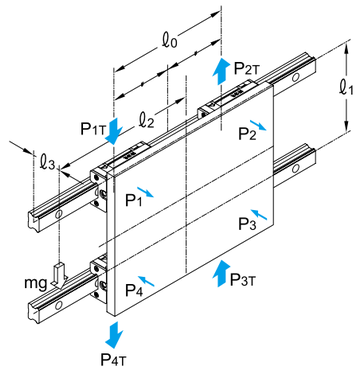
Condition 3 Vertical axis



$$P_{1} \sim P_{4} = \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{1T} \sim P_{4T} = \frac{mg \cdot \ell_3}{2 \cdot \ell_0}$$

Condition 4 Vertical axis with wall mounted

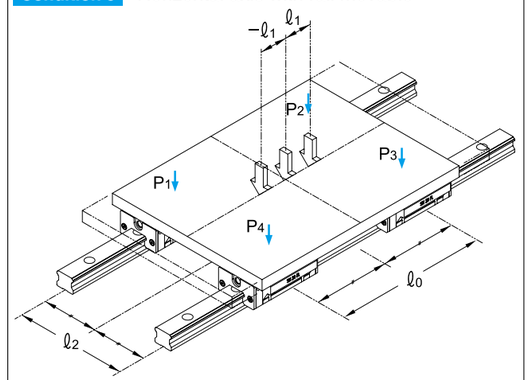


$$P_{1} \sim P_{4} = \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$$

$$P_{1T} = P_{4T} = \frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{2T} = P_{3T} = \frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

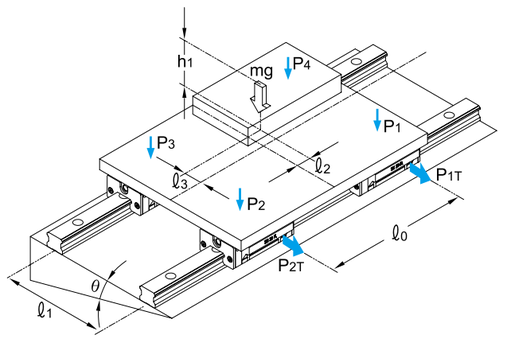
Condition 5 Horizontal axis with rail movable



$$P_{1} \sim P_{4\,(max)} = \frac{mg}{4} + \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

$$P_{1} \sim P_{4\,(min)} = \frac{mg}{4} - \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

Condition 6 Lateral axis



$$P_{1} = \frac{mg \cdot \cos\theta}{4} + \frac{mg \cdot \cos\theta \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \cos\theta \cdot \ell_3}{2 \cdot \ell_1} + \frac{mg \cdot \sin\theta \cdot h_1}{2 \cdot \ell_1}$$

$$P_{1T} = \frac{mg \cdot \sin\theta}{4} + \frac{mg \cdot \sin\theta \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{2} = \frac{mg \cdot \cos\theta}{4} - \frac{mg \cdot \cos\theta \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \cos\theta \cdot \ell_2}{2 \cdot \ell_1} + \frac{mg \cdot \sin\theta \cdot h_1}{2 \cdot \ell_1}$$

$$P_{2T} = \frac{mg \cdot \sin\theta}{4} - \frac{mg \cdot \sin\theta \cdot \ell_2}{2 \cdot \ell_0}$$

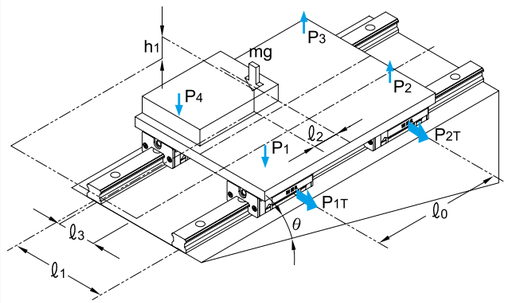
$$P_{3} = \frac{mg \cdot \cos\theta}{4} - \frac{mg \cdot \cos\theta \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \cos\theta \cdot \ell_3}{2 \cdot \ell_1} - \frac{mg \cdot \cos\theta \cdot h_1}{2 \cdot \ell_1}$$

$$P_{3T} = \frac{mg \cdot \sin\theta}{4} + \frac{mg \cdot \sin\theta \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{4} = \frac{mg \cdot \cos\theta}{4} + \frac{mg \cdot \cos\theta \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \cos\theta \cdot \ell_3}{2 \cdot \ell_1} - \frac{mg \cdot \sin\theta \cdot h_1}{2 \cdot \ell_1}$$

$$P_{4T} = \frac{mg \cdot \sin\theta}{4} + \frac{mg \cdot \sin\theta \cdot \ell_2}{2 \cdot \ell_0}$$

Condition 7 Longitudinal axis



$$P_1 = \frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$$

$$P_{1T} = \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_0}$$

$$P_2 = \frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$$

$$P_{2T} = \frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$$

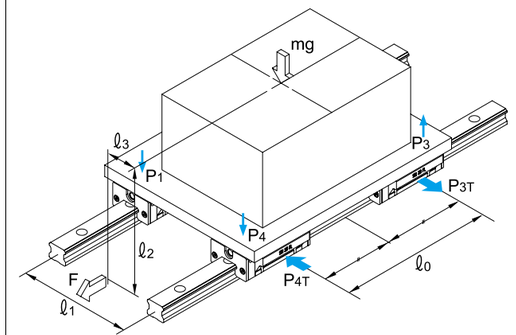
$$P_3 = \frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$$

$$P_{3T} = \frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$$

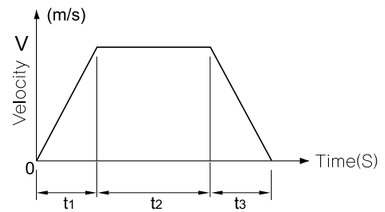
$$P_4 = \frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$$

$$P_{4T} = \frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$$

Condition 8 Horizontal axis with inertia



$$\alpha_n = \frac{V}{t_n}$$



Velocity diagram

Acceleration

$$P_1 = P_4 = \frac{mg}{4} - \frac{m\cdot\alpha_1\cdot\ell_2}{2\cdot\ell_0}$$

$$P_2 = P_3 = \frac{mg}{4} + \frac{m\cdot\alpha_1\cdot\ell_2}{2\cdot\ell_0}$$

$$P_{1T} \sim P_{4T} = \frac{m\cdot\alpha_1\cdot\ell_3}{2\cdot\ell_0}$$

In uniform motion

$$P_{1T} \sim P_4 = \frac{mg}{4}$$

Deceleration

$$P_1 = P_4 = \frac{mg}{4} + \frac{m\cdot\alpha_3\cdot\ell_2}{2\cdot\ell_0}$$

$$P_2 = P_3 = \frac{mg}{4} - \frac{m\cdot\alpha_3\cdot\ell_2}{2\cdot\ell_0}$$

$$P_{1T} \sim P_{4T} = \frac{m\cdot\alpha_3\cdot\ell_3}{2\cdot\ell_0}$$

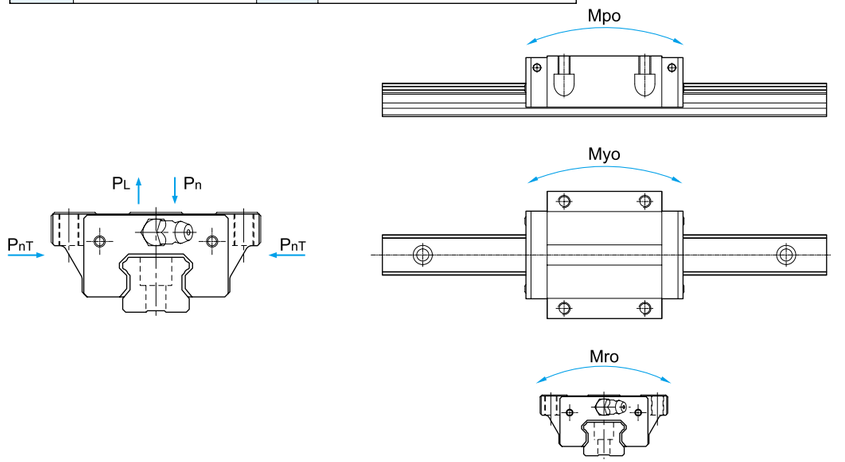
3-2. Calculating the Equivalent Load

Linear Rail Systems can accept normal and moment (Mro, Mpo, Myo) loads in all directions including radial, reverse-radial and lateral loads at the same time. Therefore, calculate the equivalent load accordingly.

$$P_E \text{ (Equivalent load)} = P_n + P_{nT}$$

P_n : Vertical load
P_{nT} : Horizontal load

P_n	Radial load	Mro	Moment in rolling direction
P_L	Reverse-radial load	Mpo	Moment in pitching direction
P_{nT}	Laterall load	Myo	Moment in yawing direction



3-3. Static Safety Factors (fs)

When calculating a load exerted on the linear rail system, both mean and maximum load need to be considered. Reciprocating machines create moment of inertia. When selecting the right linear rail system, consider all of loads.

Radial load is large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_O}{P_n} \geqq f_S$
Reverse-radial load is large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_{OL}}{P_L} \geqq f_S$
laterall load is large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_{OT}}{P_{nT}} \geqq f_S$

- f_S : Static safety factor
- $C_O(N)$: Basic static load rating (radial)
- $C_{OL}(N)$: Basic static load rating (reverse-radial)
- $C_{OT}(N)$: Basic static load rating (lateral)
- $P_n(N)$: Calculated load (radial)
- $P_L(N)$: Calculated load (reverse-radial)
- $P_{nT}(N)$: Calculated load (lateral)
- f_H : Hardness factor
- f_T : Temperature factor
- f_C : Contact factor

[Value of static safety factor (fs)]

Operating	Load conditions	Lower limit of fs
Normally stationary	Impact load or machine deflection is small	1.0 ~ 1.3
	Impact or twisting load is applied	2.0 ~ 3.0
Normally moving	Normal load is exerted or machine deflection is small	1.0 ~ 1.5
	Impact or twisting load is applied	2.5 ~ 7.0

3-4. Calculating the Mean Load

Loads acting on a linear rail system can vary according to various conditions. All load conditions must be taken into consideration in order to calculate the required linear rail system capacity

[Equation for calculating the mean load]

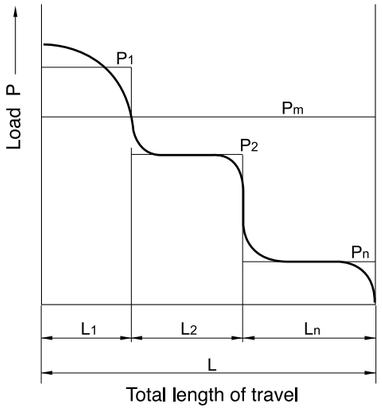
P_m :	Mean load	(N)
P_n :	Varying load	(N)
L :	Total length of travel	(mm)
L_n :	Length of travel carrying P_n	(mm)

$$P_m = \sqrt[3]{\frac{1}{L} \cdot \sum_{m=1}^{n} (P_n^3 \cdot L_n)}$$

1) Step loads

$$P_m = \sqrt[3]{\frac{1}{L}(P_1^3 \cdot L_1 + P_2^3 \cdot L_2 \cdots + P_n^3 \cdot L_n)} \cdots\cdots (1)$$

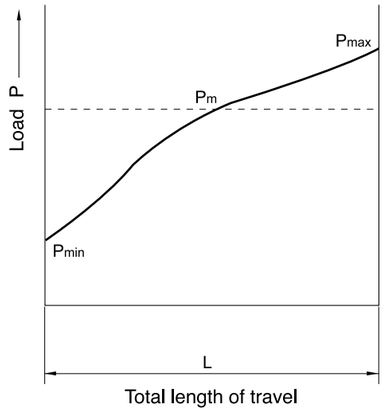
P_m :	Mean load	(N)
P_n :	Varying load	(N)
L :	Total length of travel	(mm)
L_n :	Length of travel carrying P_n	(mm)



2) Loads that vary linearly

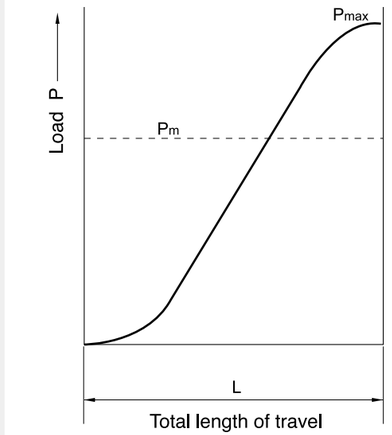
$$P_m \fallingdotseq \frac{1}{3}(P_{min} + 2 \cdot P_{max}) \cdots\cdots (2)$$

P_{min} :	Minimum load	(N)
P_{max} :	Maximum load	(N)

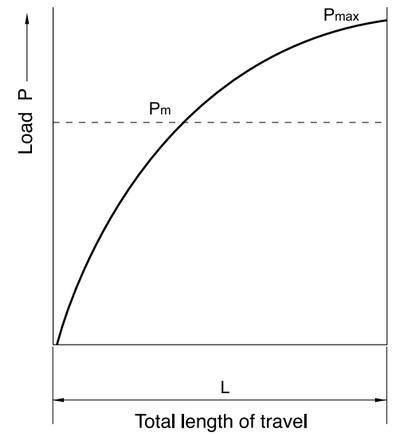


3) Loads varying sinusoidally

a) $P_m \fallingdotseq 0.65_{max}$ ····· (3)



b) $P_m \fallingdotseq 0.75_{max}$ ····· (4)



3-5. Life Calculation

The equation of nominal life for linear rail system is shown as below.

[Calculation of nominal life]

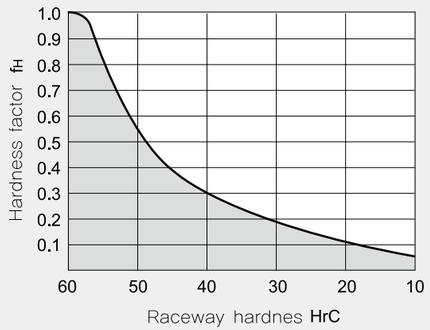
$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3 X\ 50$$

- L (km) : Nominal life
- P_C(N) : Calculated load
- C (N) : Basic dynamic load rating
- f_H : Hardness factor
- f_T : Temperature factor
- f_C : Contact factor
- f_W : Load factor

Hardness factor (f_H)

To optimize the load capacity of a linear rail system, the hardness of the rail should be HrC 58~62.

※ The value for linear rail system is normally 1.0 since the linear rail system has sufficient hardness.

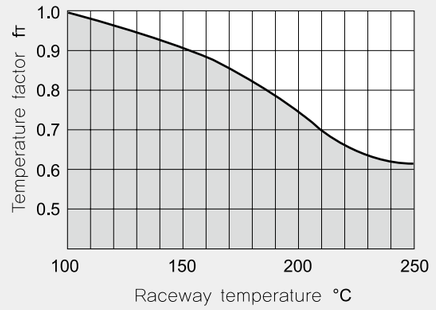


Temperature factor (f_T)

If the temperature of the linear rail system is over 100°C, The hardness of the block and rail will be reduced, and as the result, the temperature factor, ft should be taken into Account.

※ The value for linear rail system is normally 1.0 when operation temperature is under 80°C.

※ Please contact us if you need linear rail system with over 80°C working condition.



Contact factor (f_C)

When two or more blocks are used in close contact, it is hard to obtain a uniform load distribution because of mounting errors and tolerances. The basic dynamic load C should be multiplied by the contact factors fc shown here.

Number of blocks in close contact	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
6 or more	0.6
Normal condtion	1.0

Load factor (f_W)

Reciprocating machines create vibrations. The effects of vibrations are difficult to calculate precisely. Refer to the following table to compensate for these vibrations.

Vibration and Impact	Velocity (V)	Load factor f_W
Very slight	Very low V ≦0.25m/s	1 ~ 1.2
Slight	Low 0.25＜V ≦1.0m/s	1.2 ~ 1.5
Moderate	Medium 1.0＜V ≦2.0m/s	1.5 ~ 2.0
Strong	High V＞2.0m/s	2.0 ~ 3.5

[Life calculation]

When the nominal life (L) is calculated. The life of linear rail system can be calculated by following equation, if the stroke and reciprocating cycles per minute are constant.

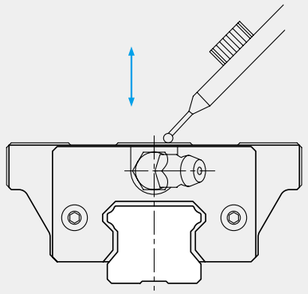
- L_h (h) : Hours of nominal life
- L (km) : Nominal life
- ℓ_s (mm) : Stroke
- n_1 (min^{-1}) : Reciprocation cycles per minute

$$L_h = \frac{L\ X\ 10^6}{2\ X\ \ell_s\ X\ n_1\ X\ 60}$$

4. Rigidity

4-1. Radial-Clearance

The block side to side movement by vibration is called clearance.



Clearance checking

After mounting the linear rail system, move the block up and down then check the change of value.

4-2. Preload

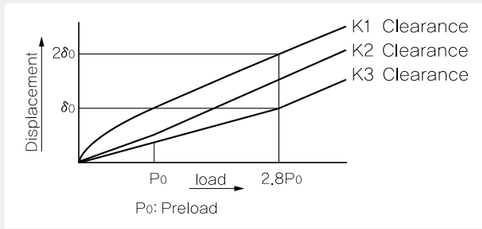
Preload affects the rigidity, internal-load and clearance. Also, it is very important to select appropriate preload according to applied load, impact and vibration expected in the application.

Preload	Conditions	Example
K3 [Heavy preload]	❐ Where rigidity is required, vibration and impact are present. ❐ Engineered machinery for heavy equipment	● Machining center ● NC lathe ● Grinding machine ● Milling machine ● Vertical axis of machine tool
K2 [Light preload]	❐ Where overhung loads or moment occur ❐ Single axis operation. ❐ Light load that requires precision.	● Measuring equipment ● Electric discharge machine ● High speed material handling equipment ● NC drilling machine ● Industrial robot ● Z axis for general industrial equipment
K1 [Normal preload]	❐ Where the load direction is constant, impact and vibration are light. ❐ Precision is not required	● Welding machine ● Binding machine ● Automatic wrapping machine ● Material handling equipment

4-3. Rigidity

When the load is applied to Linear Rail Systems, the balls, blocks and rails experience the elastic deformation within permissible range. The ratio of displacement is known as the rigidity.
The rigidity increases as the preload increases.

In case of four way equal load type, the preload is available until the load increases to some 2.8 times the preload applied.

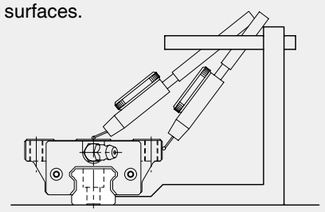


$$K = \frac{P}{\delta}$$

K (N/μm) : Rigidity
δ (μm) : Displacement
P (N) : Calculated load

5. Accuracy

Accuracy of linear rail system is generally defined by the running parallelism or the vertical and horizontal variations between the block and the rail mounting surfaces.



5-1. Running parallelism

It is tolerance of parallelism between reference of block and rail when the rail is mounted and block is moving in the whole length of rail.

5-2. Difference in Height

Difference in height between blocks on the same rail.

5-3. Difference in width

Difference in width between rail and blocks on the same rail

5-4. Accuracy level

Accuracy levels are divided into three type – **N, H** and **P**.

※See the dimension pages for each accuracy.

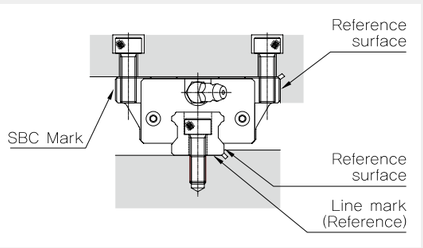
6. Design of system

Mounting method, tolerance of the mounting sufraces, and order in which the rails are mounted all affect the accuracy of machine,. Therefore we recommend considering below conditions.

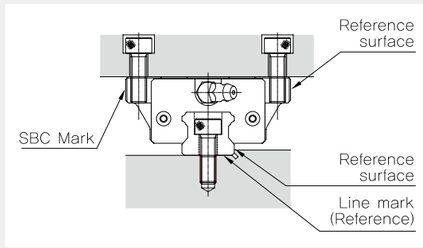
6-1. Identifying reference surface

The unmarked edge of the block and the lined edge of the rail define the reference surfaces. Please note the methods below for locating these surfaces in your design.

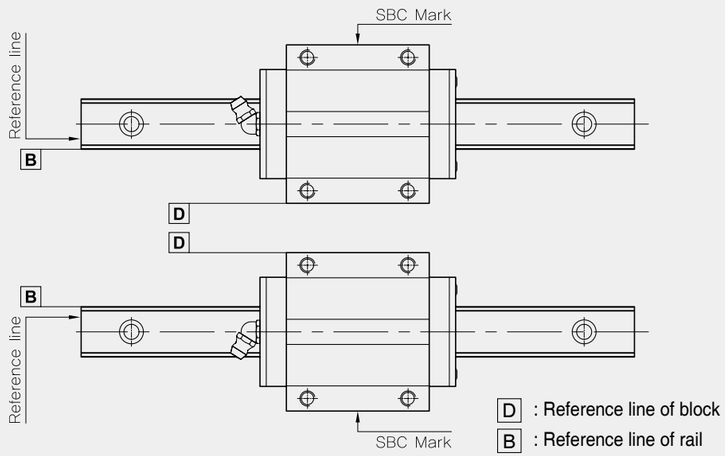
[Master linear rail system]



[Subsidiary linear rail system]



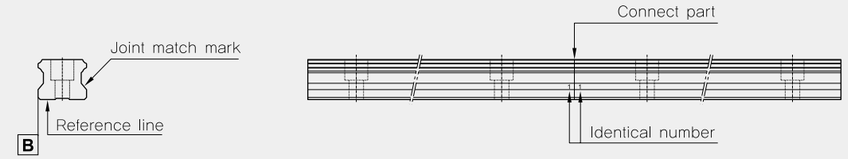
[Example of identifying reference line for pair usage]



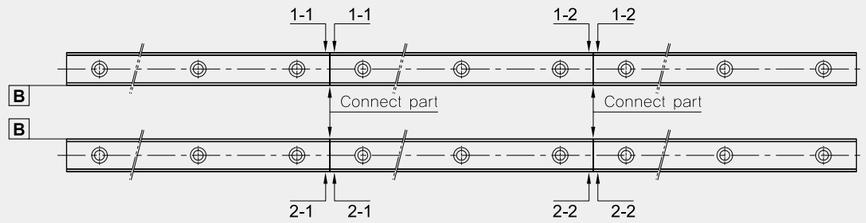
[Rail joint marking]

For extremely long travel applications it may be necessary to join the rails via a butt joint. These joint are matched for continuous smooth motion at the factory and numbered. When installing the segments insure that the numbers at the joints match. In the case of a double rail system the first of the two numbers identifies the rail.

Two rail joining method



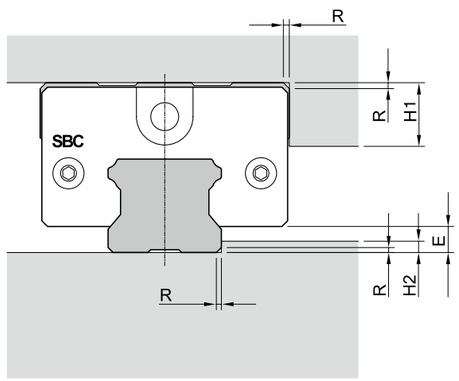
2 axis application and multiple rail joining method



6-2. Shoulder height and fillet radius R

When the bearing and rail are installed on the table and base, the fillet radius, chamfer size and shoulder height must be considered.

※ See the each pages for shoulder height and fillet radius R.

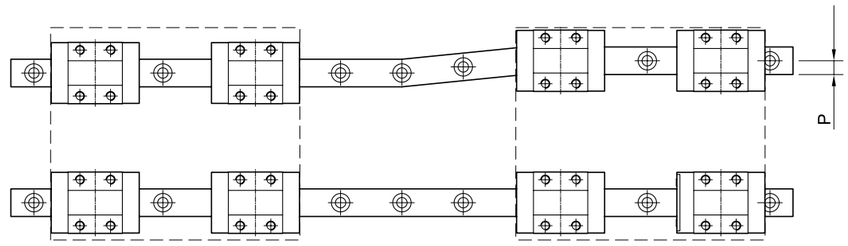


6-3. Permissible tolerance of mounting surface

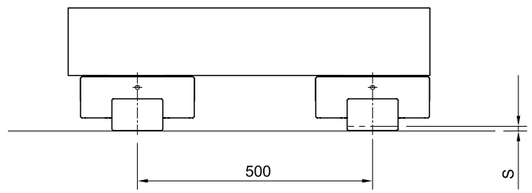
Mounting errors can cause rolling resistance to motion. Due to the self adjusting feature of the SBC linear rail system, rolling resistance or bearing will not be affected as long as the permissible tolerance is observed as per the table shown in the catalogue.

※ See the each page for permissible tolerance of mounting surface.

[Permissible tolerance (P) of parallelism]



[Permissible tolerance (S) of rail mounting surface height variation]



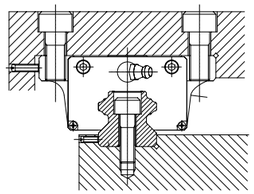
6-4. Mounting linear rail system

[Securing Method for Blocks and Rails]

Normally, both the bearing block and rail are mounted to the structure with bolts. When a horizontal load is applied, shock, or vibration, it is recommended that the rail be clamped horizontally against the reference surface.

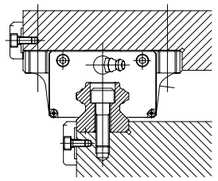
(1) Cap screw mounting

Small bolts are used when space is limited. The number of bolts can be adjusted as necessary.



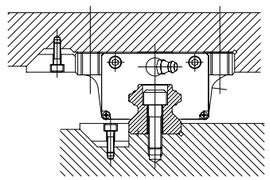
(2) Horizontal clamp mounting

This method provides an easy solution to shock and vibration applications.



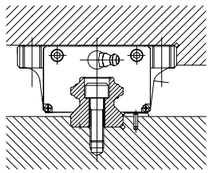
(3) Tapered Gib

This method offers the most secure means for locating the rail and block against the reference surface.



(4) Dowel Pin

Where the forces are lower and the costs more critical, dowel pins can be used to fix the rail.



[Rail Mounting procedure]

❶ Clean and dry the mounting surface.

❷ Coat each surface with low viscosity spindle oil, then place the rail on the surface and then lightly tighten the mounting bolts temporarily.

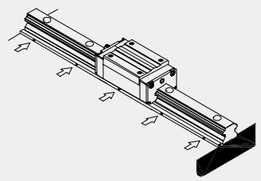
❸ Place the carriage plate on the blocks carefully and tighten the mounting bolts temporarily.

❹ Position the carriage plate by tightening the master block against the reference surface using the selected securing method and tighten the mounting bolts with a torque wrench.
※ Follow the above order to mount subsidiary blocks.

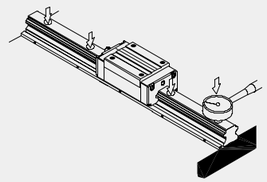
① Checking the mounting

② Setting the rail against the datum plane

③ Tightening set screws



④ Final tightening of mounting bolts

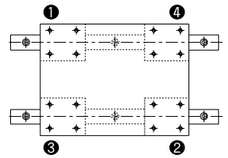


[Block Mounting procedure]

❶ Clamp the reference rail in place and tighten the mounting bolts with a torque wrench, making several passes to reach the desired torque

❷ Carefully position the table with bearings onto the rails and tighten the non-reference blocks with a torque wrench.

❸ Starting at one end ,move the table along the rail and tighten the non-reference rail slowly during several passes with a final pass using the torque wrench. Do not over tighten



[Bolt mounting torque]

Below bolt mounting torque is recommended for mounting the rail.

Unit : N.cm

Bolt	Mounting torque		
	Steel	Cast iron	Aluminum
M2	58.8	39.2	29.4
M2.3	78.4	53.9	39.2
M2.6	118	78.4	58.8
M3	196	127	98
M4	412	274	206
M5	882	588	441
M6	1370	921	686
M8	3040	2010	1470
M10	6760	4510	3330
M12	11800	7840	5880
M14	15700	10500	7840
M16	19600	13100	9800
M20	38200	25500	19100
M22	51900	34800	26000
M24	65700	44100	32800
M30	130000	87200	65200

7. Lubrication

Lubrication for linear rail system is a key part of its performance.

- Reduce friction and wearing for each moving part.
- Eliminate the heat on linear rail system.
- Prevent corrosion on inside and outside of linear rail system.
- Dust-prevention.

7-1. Lubrication requirements for linear rail system

- Form a strong oil film
- Have high thermal stability
- Low-friction
- High water resistance
- Oil must have high-viscosity and grease must have consistency again repeated agitation of grease
- Non-corrosive

7-2. Comparison of lubrication

A comparison of the application features for oil and grease used in linear rail system is shown in the table below.

Item	Grease	Oil
Rotation	Low, intermediate	High
Seal	Simple	Cautious
Lubrication change	Complicated	Simple
Life	Short	Long
Thermal radiation	Bad	Good
Friction torque	Large	Less
Performance	Good	Excellent

(1) How to grease

- **With grease gun :** The grease is fed through the grease fitting on linear rail system.
- **With pump :** The grease is fed periodically by automation pump.

(2) How to feed oil

- Oil-brushed on, sprayed or pumped.

7-3. Lubricants interval

Lubricants intervals vary according to the environment and working condition of machine. Therefore, below lubricant intervals are recommended. Do not mix oil and grease systems.

Item	Checking time	Lubricant interval	Working condition and outcome
Grease	3 ~ 6 months	1,000 km	Normal working condition (Load ≤ 0.15C)
Oil	1 week	40km	Volume and (Load ≤ 0.3C, V ≤ 1m/s)
	Everyday	Any time	Volume of oil

7-4. Class of oil

Lubricant	Class
Oil	Coolant oil, turbine oil ISOVG32 ~ 68

7-5. Classification and selection of lubrication

Lubricant for linear rail system must be selected after considering vibration, clean room, vacuum and working condition.

SBC supplies two kinds of grease as standards.

Item	Application	Brand
Normal working condition	Multipurpose industrial application	Shell Gadus S2 V100 3 [Korea Shell]
Special working condition	Clean room	SNG 5050 [NTG Korea]
	Vibration	
	Wide temperature	

* Please contact SBC for the requests below

-when you need MSDS(Material Safety Data Sheet) according to Grease Type

-when you use our product in environments beyond the scope of use

Technical Data

[**Normal working condition:** Multipurpose industrial application]

[1] General

- **Name :** Shell Gadus S2 V100 3
- **Company :** Korea Shell
- **Appearance :** Bright brown color, semi-solid in normal temperature

[2] Special feature

- High load resistance
- Anti-corrosive
- High liquidity
- High mechanical stability

[3] Representative feature

- **Consistency enhancer :** Lithium/Calcium
- **Base oil :** Mineral oil
- **Working temperature :** -10°C ~ 120°C

Test item	Representative value	Test method
Base oil Kinematic Viscosity @ 40°C cSt 100°C cSt	Mineral oil 100 11	IP 71/ASTM-D445
Cone Penetration Confusion @ 25°C 0.1mm	220~250 (3)	IP 50/ASTM-D217 (NLGI *)
Dropping Point °C	195	IP 396

* NLGI :National Lubricating Grease Institute

Consistency test method	KS	NLGI
	220 ~ 250	3

Technical Data

[**Special working condition :** Wide-temperature and low dust accumulating]

[1] General

- **Name :** SNG5050
- **Company :** NTG Korea
- **Appearance :** Butter in normal temperature

[2] Special feature

- Excellent stability of oxidation
- Long life grease
- Low dust accumulating and excellent chemical-resistance
- Wide temperature range

[3] Representative feature

- **Consistency :** Urea
- **Base oil :** Synthetic oil
- **Working temperature :** -40°C ~ 200°C

Test item		Representative value	Test method
Consistency [25°C, 60 times]		3	NLGI *
Dropping point		280°C	JIS K 2220 5.4
Evaporation (22h) mass %	99°C	0.11%	JIS K 2220 5.6
	150°C	0.57%	JIS K 2220 5.6
Oil separation rate (24h) mass %	150°C	0.5%	JIS K 2220 5.7
Film evaporation (24h) mass %	150°C	5.54%	-
	180°C	16.44%	-
Stability of oxidation [99°C, 100h] mass %		0.015%	JIS K 2220 5.8
Mixing stability [100,000cycles]		Pass	ASTM D 1743
Wear resistance (1200rpm, 392N, room temperature 1h)		0.57	ASTM D 2266

* NLGI : National Lubricating Grease Institute

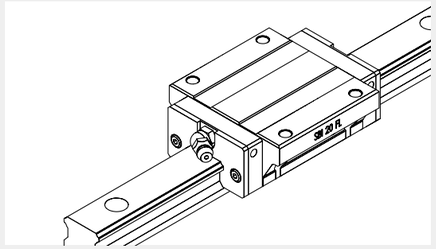
Consistency test method	KS	NLGI
	220 ~ 250	3

7-6. Grease fitting

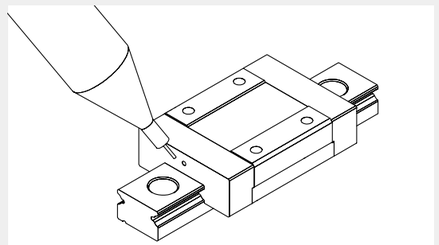
Select the appropriate grease fitting from below options in accordance with design.

[Standard grease fitting]

Front grease fitting (except SBM, SBMW) for linear rail system is standard grease fitting.



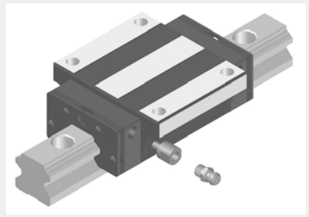
(SBG, SBI front grease fitting)



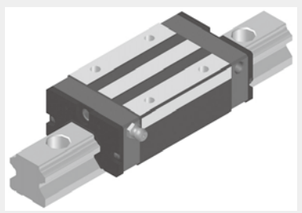
(SBM, SBMW front grease fitting)

[Side grease fitting]

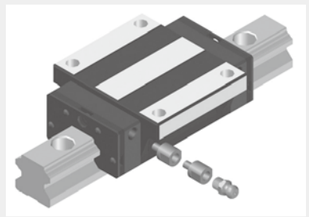
When greasing is difficult because of limited space in front of the grease nipple, the side grease fitting can be supplied. (*Side grease fitting is not available for SBM, SBMW.)



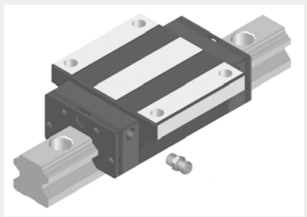
(SBG, SBI 15~25 FL side grease fitting)



(SBG, SBI SL side grease fitting)



(SBG 30~35 FL side grease fitting)
(SBI 30~45 FL side grease fitting)



(SBG 45~65 FL side grease fitting)
(SBI 55~65 FL side grease fitting)

8. Safety design

Dust prevention, rust prevention and re-lubrication according to working conditions of the linear rail system are necessary for required life time.

8-1. Anti-rust (Anti-rust Treatment)

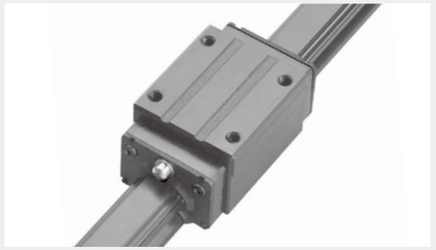
2 types of surface treatment are available for anti-rust and appearance.

[AR-H : Black chrome coating]

Since black chrome coating is penetrating to rail and block, so it achieves higher corrosion resistance.

[AR-2F : Fluorocarbon chrome coationg]

Fluorocarbon chrome coating on black chrome coating is suitable when high corrosion resistance is required (water or salty water working condition).



(AR-H : Black chrome coating)

[Caution for surface treatment]

❶ Be aware that the rail hole may not surface treated.

❷ Set the higher safety factor in case surface treated linear rail system is selected.

❸ Except above surface treatments, the other plating may cause performance problems.

❹ Contact SBC for other information on surface treatments.

8-2. Dust protection

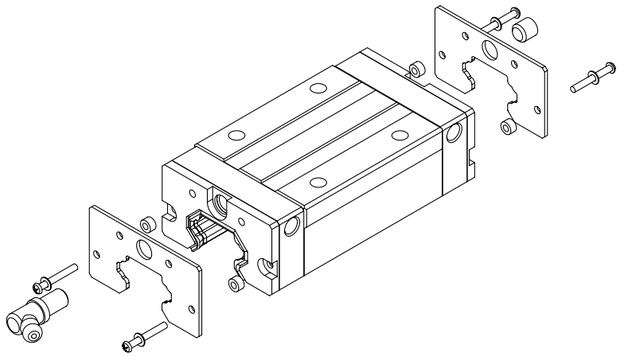
The dimensions for each seal is shown on dimension page.

[Seal options]

Select the appropriate seal options according to working conditions.

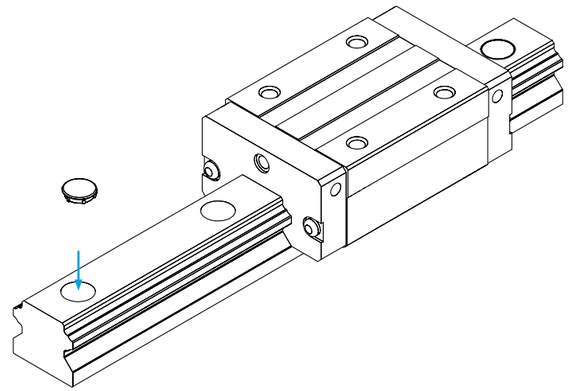
Item	Symbol	Application
End seal + Bottom seal	No symbol (Standard)	Normal condition
End seal + End seal + Bottom seal	DD	Dust condition
End seal + Scraper + Bottom seal	ZZ	Welding spatter
End seal + End seal + Scraper + Bottom seal	KK	Dust and chips

* Bottom seal is not available for SBI, SBG, SBS15



[**RC cap:** rail hole cap]

Contaminants invade into the bolt holes of the rail and pollute the inside of the bearing. You can use hole caps made from hardened rubber to fill the holes. RC caps are provided with the rails.



◁ RC cap mounting method ▷

❶ Bolt the rail on the plate.

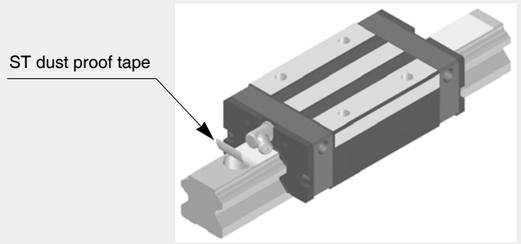
❷ Put the RC cap on the rail mounting hole and place the bigger steel plate on the cap then tap it with hammer.

❸ Check the RC cap to make sure it is properly seated.

[ST dustproof tape]

Stainless steel ST dustproof tape greatly improves rail face sealing and works in conjunction with guide block seals. Conventional plastic plugs do not offer the same improved sealing performance.

※ If you use ST tape and RC cap together, it would be more effective.



◁ Installation of ST tape ▷

❶ After assembling a rail to the bed, clean the surface of the rail and remove any oil.

❷ Attach the ST tape slowly over the rail length to within 2 or 3 mm from each end of the rail.

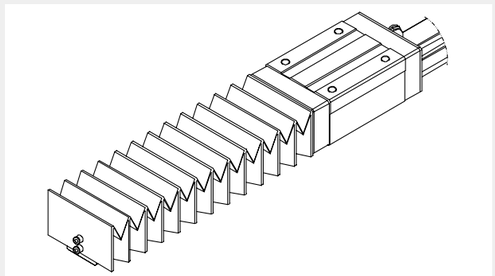
❸ After attachment to the rail, apply pressure with dry cloth 3 or 4 times along the length of the rail to release encapsulated epoxy. Tape should be applied 4 to 6 hours prior to use to allow initial bonding.

※ It is strongly recommended to wear safety gloves, the edge of this tape is sharp and can cut as you attach it to the rail.

[Bellows]

For the best protection of the linear rail system, bellows should be used.

※ We recommended to use additional Telescopic tool, if you use it in dust environment.



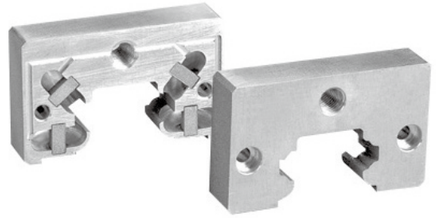
● Reference : SBI type : SH-A
SBG type : SH

8-3. High temperature design

[HT end-plate]

If working temperature is more than 80°C, SBC supply the high temperature end-plate which is made of aluminum.

● Recommended working temperature : -30 ~ 150°C



※ When High Temperature end-plate is applied to a block,
-The product will be released without all plastic components (end-plate, end-seal, bottom seal, return tube plate)
-Please set up addtional measures to prevent dust

8-4. High dust-proof and self-lubricant container

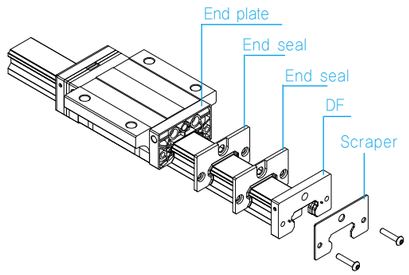
For protecting the linear rail system from fine foreign matter and where the grease feeding is not easy, SBC created the high dust-proof, (DF) seal and self-lubricant container (MF).

● Function and classification in accordance with seal type

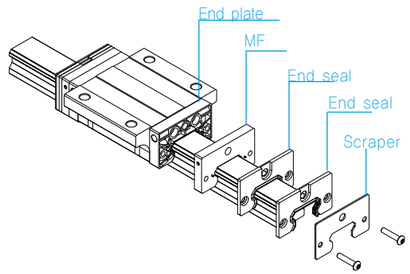
DF : Dust protection for microscopic dust
MF : Self lubricating for long maintenance intervals

● Components and Order of assembly based on the type of seal

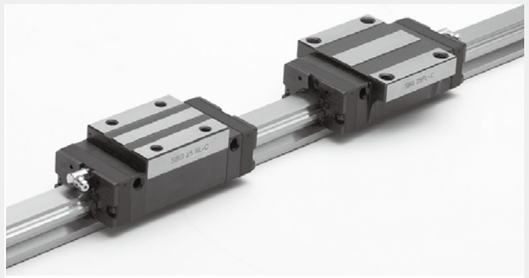
DF : Dust protection for microscopic dust



MF : Self lubricating for long maintenance intervals



Symbol	Components and Order of assembly	Symbol	Components and Order of assembly
DF	End plate+End seal+DF	MF	End plate+MF+End seal
DFDD	End plate+End seal+End seal+DF	MFDD	End plate+MF+End seal+End seal
DFZZ	End plate+End seal+DF+Scraper	MFZZ	End plate+MF+End seal+Scraper
DFKK	End plate+End seal+End seal+DF+Scraper	MFKK	End plate+MF+End seal+End seal+Scraper

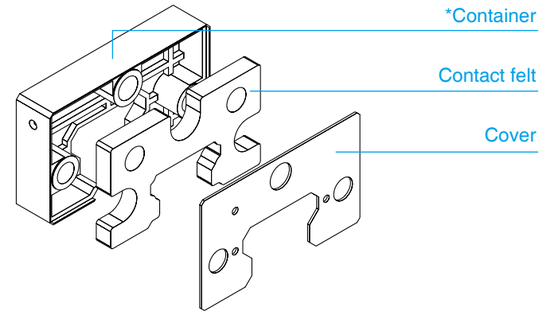


Linear Rail System

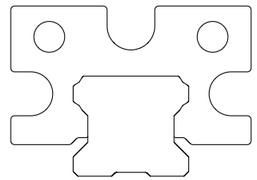
Technical Data

[High dust-proof seal : DF seal]

High-density felt built in DF container wipes the raceway tracking profile so it achieves higher dust protection.
An additional seal or scraper may be added for highly contaminated applications.



* Container
- Its contact surfaces are tolerance match to the guiderail to ensure perfect sealing.

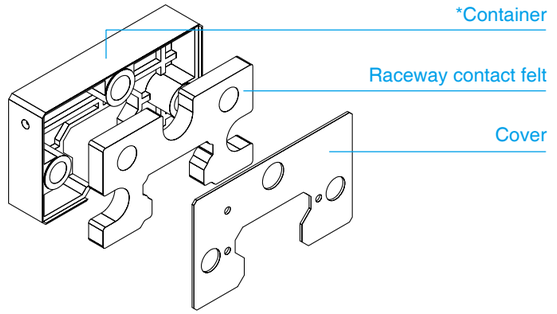


(fully contact the rail and wipe the dust)

※ Caution
If you would like to use DF seal in watery or clean-room working condition, please contact SBC.

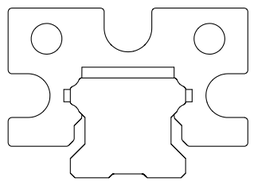
[Self lubricant : MF container]

MF (Self lubricanting) contains grease impregnated felt which feeds the grease on the raceway continuously. Each compact seal kit will guarantee total surface lubrication and long maintenance free bearing life.



* Container

- Its contact surfaces are tolerance match to the guiderail to ensure perfect sealing.



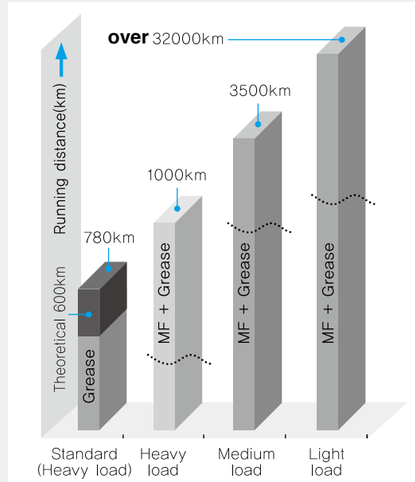
(Wipe the raceway and grease is coating on the raceway)

8-5. MF container Lifetime test

[Performance test]

- SBG20SL-1-K1-1500-N

Condition	Heavy	Medium	
Load	4.9kN	2.5kN	1.0kN
Velocity	20m/min		
Theoretical Lifetime	600km	1500km	-



[Grease feeding]

The MF container may be re-charged by adding grease to hole inside of block with a syringe.

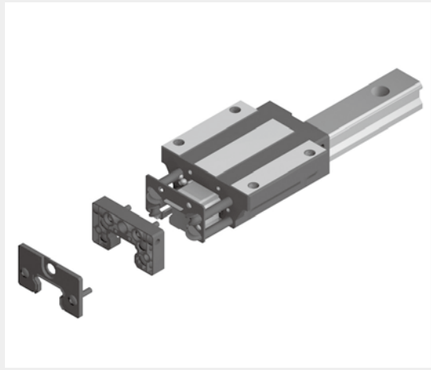
※ Caution

If MF container is required to use in special working condition like clean room, please contact SBC.

The Types of Linear Rail System

SBI high-load type

With all advantages of our SBG type, SBI improves load capacity, and increases speed capabilities for the rail system.

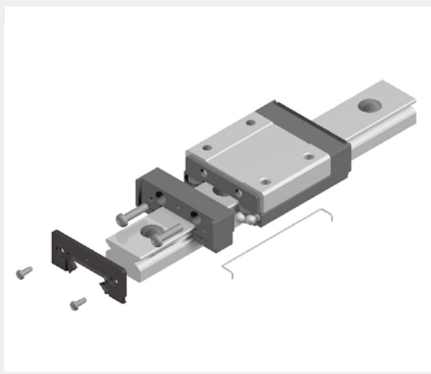


SBI type

-Type: SBI15~65

SBM miniature type

Miniature linear rail system with compact size also achieve high-load.



SBM (Standard miniature)

-Type: SBM07~15

SBML (High-load miniature)

-Type : SBML09~15

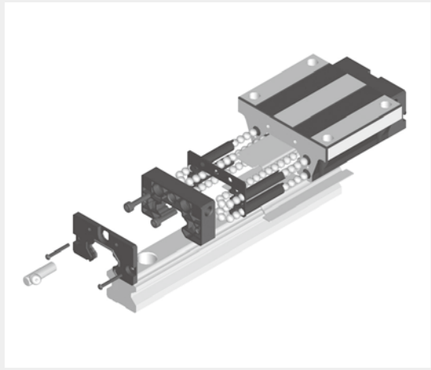
SBMW (Wide type miniature)

-Type: SBMW09~15

The Types of Linear Rail System

SBG standard type

Standard SBC linear rail system.



SBG type

Type: SBG 15~65

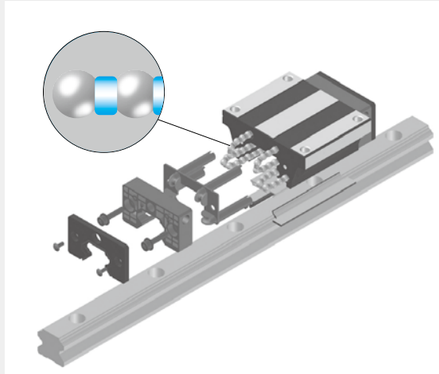
SBS type

-Assembly height is lower than SBG type

-Type : SBS 15~45

SPG spacer type

Low noise type in which the plastic spacer are inserted in between balls.



Low noise (Spacer type)

Spacer are inserted in between balls

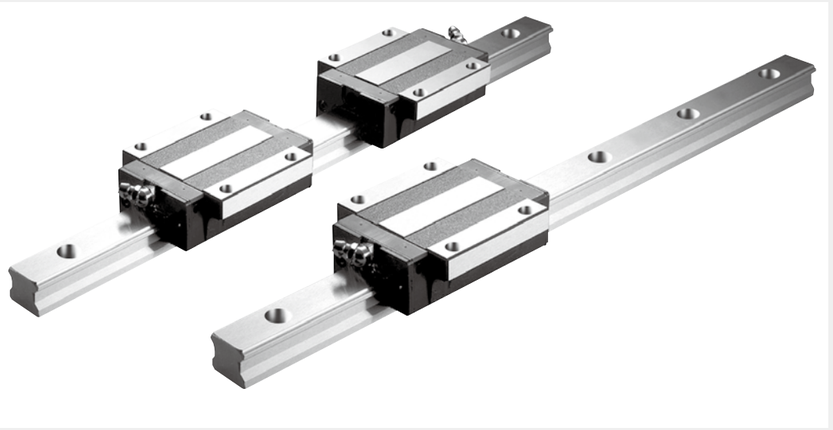
SPG Type (=SBG dimensionally interchangeable)

Type : SPG 20~35

SPS Type (=SBS dimensionally interchangeable)

-Type: SPS 20~35

SBI High-load Linear Rail System



Circular arc groove

Two point contact structure of circular arc groove. It keeps the function of self-aligning and smooth rolling performance.

45° angle of contact

Four rows of circular arc groove contact balls at an angle of 45 degrees provides the same capacity in all directions.

DF structure

Low noise and High rigidity

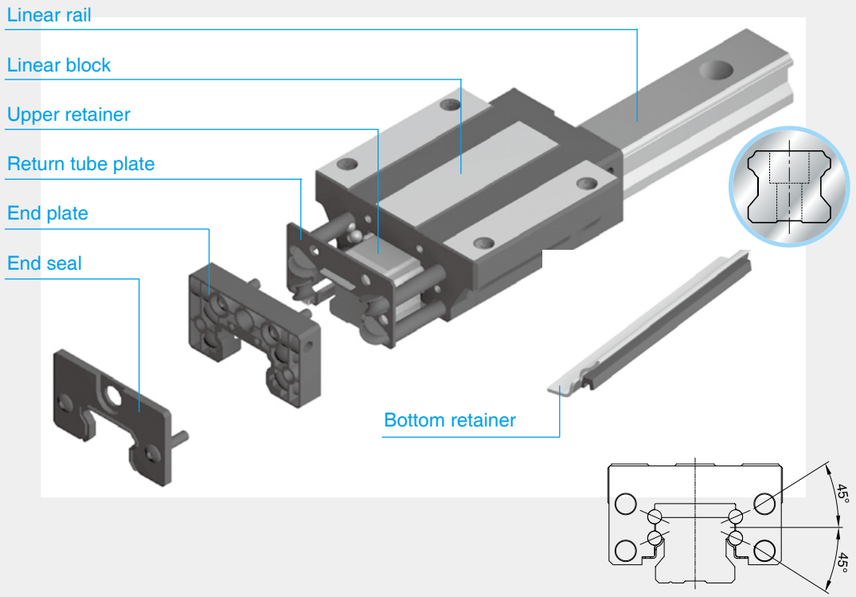
Optimized ball recirculation structure and design provides low noise and high-rigidity.

The same dimension

The dimension of height, width and mounting holes are the same as SBG series, with only a slight variation in block length.

SBI High-load Linear Rail System

The feature of structure



End seal New double lip structure which improves resistance to dust and particle contamination.

End-plate Manufactured with a new high rigidity engineered plastic. Designed to withstand the highest of unplanned impact loads without breaking.

Retainer Ball retainer plates now snap assembled to the blocks and this unique assembly method allows an amount of internal self-alignment and load sharing while maintaining rigid ball control.

Return tube plate The end plate and reversing ramps of new ball return tubes are now molded as one complete body. This allows for smoother ball rotation through the critical transition points, significantly improving rolling performance, lower operating better lubricant retention inside the bearing.

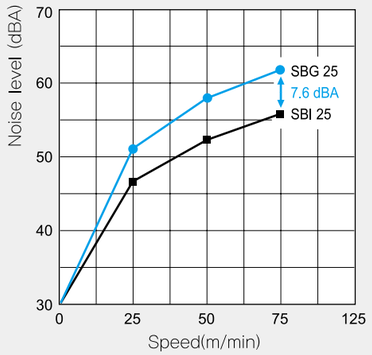
Linear block Highly rigid structure with a lager recirculation radius for the smooth movement and longer block length for higher load capacity.

Linear rail SBI rail is designed with a low profile and wide base. This characteristic allows greater stability in operation and during manufacture. Results in greater linear precision.

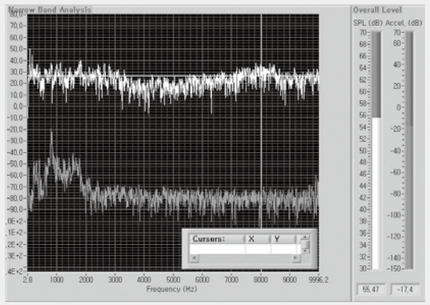
SBI High-load Linear Rail System

[Low noise]

- SBI25 / SBG25 noise level test data



(Comparison of noise level)

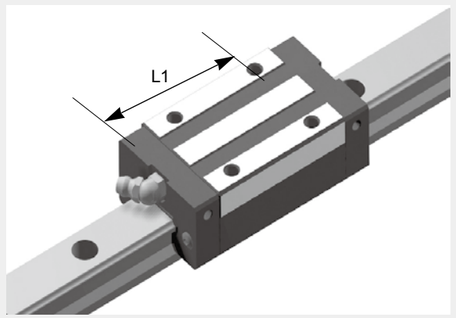


(SBI 1.3m/sec)

[High load performance]

SBI type is improved load capacity from the longer block length and changed radius of curvature

- The comparison of SBI / SBG block length

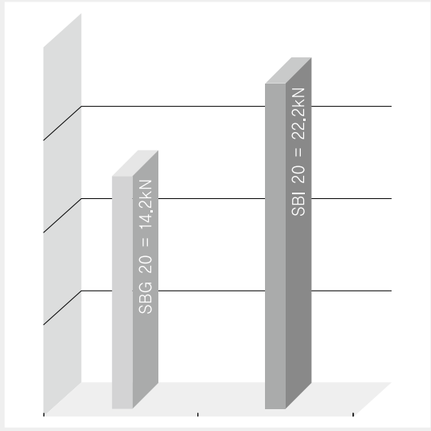


(Unit : mm)

L1 length	SBG	SBI
15SL	38.8	45.2
20SL	50.8	56.8
25SL	59.5	70

SBI High-load Linear Rail System

- The comparison of basic dynamic load rating



(Comparison of basic dynamic load rating)

Improved geometry and tolerances increases basic dynamic load rating

- Comparison of lifetime calculation

- L (km) : Nominal life
- C (kN) : Basic dynamic load rating
- P (kN) : Calculated load

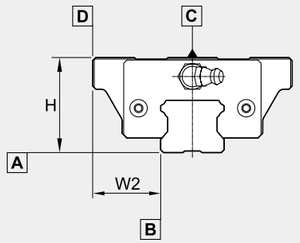
$$L = \left(\frac{C}{P}\right)^3 X\ 50km$$

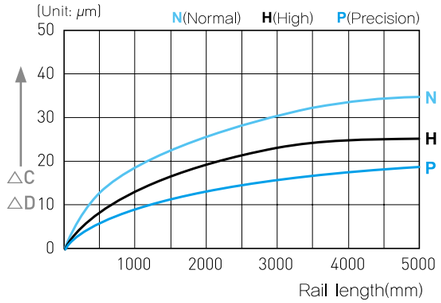
In case of P = 5 kN
Basic dynamic load rating (C) of SBI20 SL : 22.2 kN
Basic dynamic load rating (C) of SBG20 SL : 14.2 kN

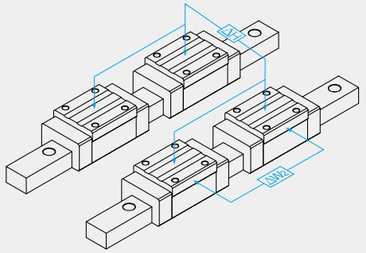
SBI 20SL : $L = \left(\frac{C}{P}\right)^3 X\ 50 = \left(\frac{22.2}{P}\right)^3 X\ 50 = 4376$ km

SBG 20SL : $L = \left(\frac{C}{P}\right)^3 X\ 50 = \left(\frac{14.2}{P}\right)^3 X\ 50 = 1145$ km

Accuracy







- Measuring dimension difference H and W2 between the carriages of the same guide

△W2 (Dimension difference W2 between the carriages of the same guide): measuring the center of block side surface(reference surface

△H (Dimension difference H between the carriages of the same guide): measuring the center of block top

(Unit : mm)

Item	N	H	P
Tolerance for the height **H**	±0.1	±0.04	±0.02
Tolerance for the rail-to-block lateral distance **W2**	±0.1	±0.04	±0.02
Tolerance for the height **H** difference among blocks	0.03	0.015	0.007
Tolerance for rail-to-block lateral distance **W2** distance among blocks	0.03	0.015	0.007
Running parallelism of surface **C** with surface **A**	△C		
Running parallelism of surface **D** with surface **B**	△D		

- **N** : Normal
- **H** : High
- **P** : Precision

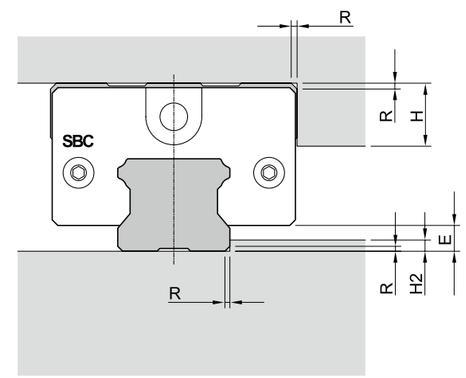
Preload

Reference	Volume of preload
K0 (None)	Clearance within 0.01mm
K1 (Normal)	Max. 0.02C
K2 (Light)	0.04 ~ 0.06C
K3 (Heavy)	0.08 ~ 0.10C

- C(kN) : Basic dynamic load rating

※ "K3 " Preload is not available for SBI15 type

Shoulder height and fillet radius R

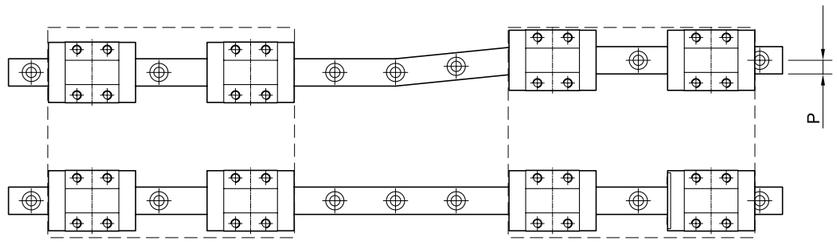


(Unit : mm)

Model number	Fillet radius R	Shoulders height H1	Shoulders height H2	E
15	0.6	7	2.5	3
20	0.6	8	3.5	4.6
25	1	10	4.5	5.5
30	1	11	5	7
35	1	13	6	7.5
45	1.6	16	8	9
55	1.6	20	10	12
65	1.6	25	15	19

SBI High-load Linear Rail System

Permissible tolerance (P) of parallelism

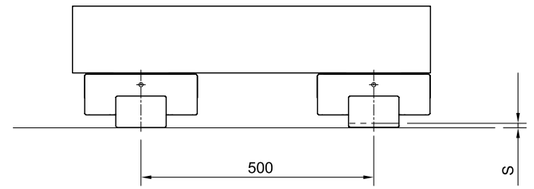


(Unit : mm)

Model size	K1	K2	K3
15	0.025	0.018	-
20	0.025	0.020	0.018
25	0.030	0.022	0.020
30	0.040	0.030	0.027
35	0.050	0.035	0.030
45	0.060	0.040	0.035
55	0.070	0.050	0.045
65	0.080	0.060	0.055

SBI High-load Linear Rail System

Permissible tolerance (S) of two level offset

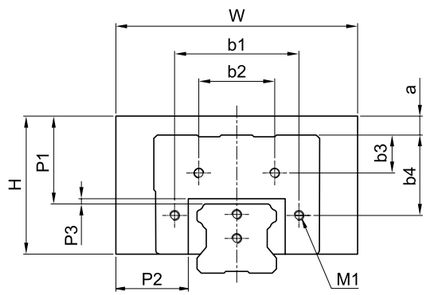


(Unit : mm)

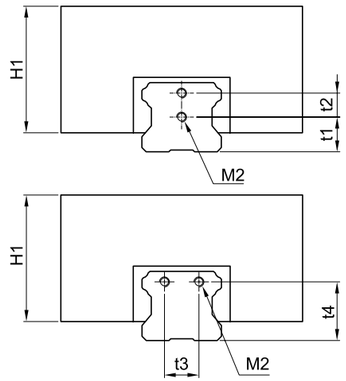
Model size	K1	K2	K3
15	0.13	0.085	-
20	0.13	0.085	0.05
25	0.13	0.085	0.07
30	0.17	0.11	0.09
35	0.21	0.15	0.12
45	0.25	0.17	0.14
55	0.30	0.21	0.17
65	0.35	0.25	0.20

SBI High-load Linear Rail System

SH Bellows



<VIEW "A">

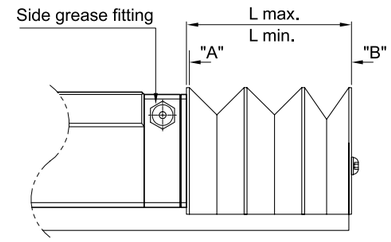


<VIEW "B">

Model number	Applicable type	W	H	H1	P1	P2	P3	a (*Dimensions according to block types)						b1	b2
								FV	SV	CL	FL	SL	HL		
SH15 A	SBI15	50	25	25	15	15.5	1	4	4	–	4	0	4	26	–
SH15 DA			20	20	10			−1	−1	–	−1	−5	−1		
SH20 A	SBI20	60	29	31	17	18	1	5.5	5.5	5.5	3.5	3.5	–	34	–
SH20 DA			24	26	12			–	–	–	−1.5	−1.5	–	(32)	
SH25 A	SBI25	70	35	35	20	21	1	7	7	7	4	0	4	36	–
SH25 DA			30	30	15			–	–	–	−1	−5	−1		
SH30 A	SBI30	80	36	36	20	23	1	–	–	–	1	−2	1	49	–
SH30 DA			33	33	17			–	–	–	−2	−5	−2		
SH35 DA	SBI35	85	39	39	20	22.5	1	–	–	–	−2	−9	−2	56	–
SH45 DA	SBI45	100	48	48	25	25	1	–	–	–	−3	−13	−3	72	–
SH55 DA	SBI55	110	56	56	30	25	1	–	–	–	−2	−12	−2	74	53.4
SH65 DA	SBI65	130	69	69	35	30	1	–	–	–	−2	−2	–	90	64

* The column of b1 dimension is only applying for SBI20CLS type.
* The dimension in column “a, b3 and b4” are common for “CL=CLL, CLS”, “FL=FLL, FLS”, “SL=SLL, SLS”, “HL=HLL, HLS”
* If SH bellows are applying, rail end mounting holes are necessary.
* When you select SH bellows, please select the side grease fitting for lubrication.
* Please contact SBC for more information.

SBI High-load Linear Rail System



[Calculation of bellows length]

$$A = \frac{L_{max}}{L_{min}}$$

- L_{max} : Extended length (mm)
- L_{min} : Collapsed length (mm)

	L_{min}	L_{max}
*SBI 15, 20	Stroke ÷ 5	L_{min} + Stroke
*SBI 25~45	Stroke ÷ 6	
*SBI 55~65	Stroke ÷ 7	

(Unit : mm)

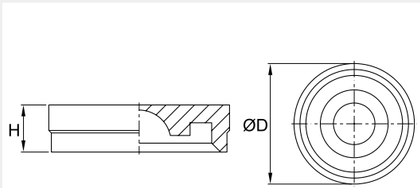
b3			b4						t1	t2	t3	t4	M x Bolt length		A Extended ratio
FL	SL	HL	FV	SV	CL	FL	SL	HL					M1(Block)	M2(Rail)	
–	–	–	13.3	13.3	–	13.3	17.3	13.3	10	–	–	–	M3X16	M4X8	6
															4
–	–	–	14	14	14	16	16	–	6	8	–	–	M3X18	M3X6	6
															4
–	–	–	16.3	16.3	16.3	19.3	23.3	19.3	10	7	–	–	M3X18	M3X6	7
															5
–	–	–	–	–	–	22.8	25.8	22.8	11	8	–	–	M4X22	M4X8	7
															6
–	–	–	–	–	–	26.5	33.5	26.5	–	–	14	21	M4X22	M4X8	7
–	–	–	–	–	–	33.5	43.5	33.5	–	–	20	25	M4X25	M5X10	7
7	17	7	–	–	–	38.5	48.5	38.5	–	–	26	29	M5X30	M5X10	8
7	7	–	–	–	–	45	45	–	–	–	34	42	M5X35	M5X10	8

Ordering example : **SH25A – 70 / 420**
❶ ❷ ❸

❶ Model number
❷ Collapsed length (mm)
❸ Extended length (mm)

※ ‘H’ dimesion of SH-DA type is lower than SH-A type

RC Cap

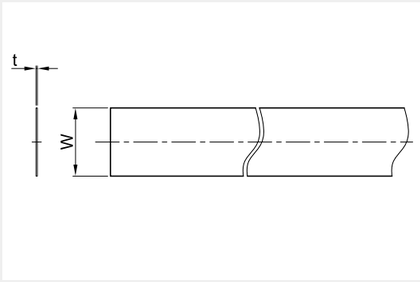


(Unit : mm)

Model	D±0.1	H±0.1
RC 15	7.6	1.3
RC 20	9.6	3.5
RC 25	11.1	2.8
*RC 30	14.2	3.7
RC 45	20.2	4.7
RC 55	23.2	6
RC 65	26.2	6

- RC 30 is used for SBI 30, 35 rail.
- SBI, SBG type use same RC cap.

ST Tape



(Unit : mm)

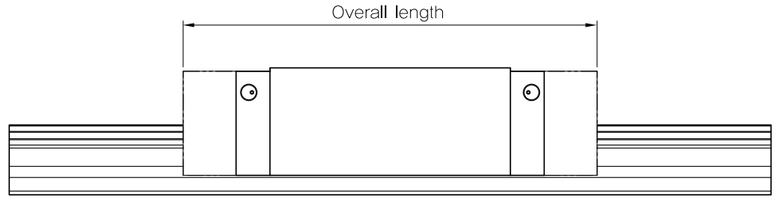
Model	W	t
ST 15A	11	0.1
ST 20A	15	0.1
ST 25A	17	0.1
ST 30A	21	0.1
ST 35A	27	0.1
ST 45A	37	0.1
ST 55A	43	0.1
ST 65A	51	0.1

Ordering example : **ST15A - 1000L**
❶ ❷

❶ Model number
❷ Length

Seal and MF container

[Method and overall length with each seal]



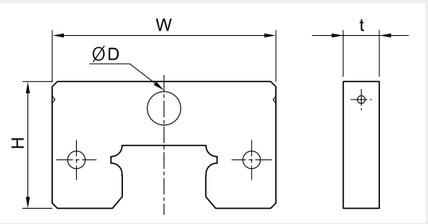
- E : End seal S : Scraper F : DF (High dust protection seal). MF (Self lubricant)

(Unit : mm)

Additional seal		표준	DD	ZZ	KK	MF	MFDD	MFZZ	MFKK	DF	DFDD	DFZZ	DFKK
Indication of seal		E	E+E	E+S	E+E+S	F+E	F+E+E	F+E+S	F+E+E+S	E+D	E+E+D	E+D+S	E+E+D+S
Overall length with seal	15V	39.9	44.5	45.3	49.9	53.9	58.5	59.3	63.9	56.9	61.5	59.3	63.9
	15S	56.8	61.4	62.2	66.8	70.8	75.4	76.2	80.8	73.8	78.4	76.2	80.8
	15	63.8	68.4	69.2	73.8	77.8	82.4	83.2	87.8	80.8	85.4	83.2	87.8
	15L	79.4	84	84.8	89.4	93.4	98	98.8	103.4	96.4	101	98.8	103.4
	20V	49.1	54.1	54.5	59.5	63.1	68.1	68.5	73.5	66.1	71.1	68.5	73.5
	20CLS	65.2	70.2	70.6	75.6	79.2	84.2	84.6	89.6	82.2	87.2	84.6	89.6
	20S	73.8	78.8	79.2	84.2	87.8	92.8	93.2	98.2	90.8	95.8	93.2	98.2
	20	78.8	83.8	84.2	89.2	92.8	97.8	98.2	103.2	95.8	100.8	98.2	103.2
	20L	96.4	101.4	101.8	106.8	110.4	115.4	115.8	120.8	113.4	118.4	115.8	120.8
	25V	52.6	57.6	58	63	66.6	71.6	72	77	69.6	74.6	72	77
	25S	83	88	88.4	93.4	97	102	102.4	107.4	100	105	102.4	107.4
	25	92	97	97.4	102.4	106	111	111.4	116.4	109	114	111.4	116.4
	25L	108	113	113.4	118.4	122	127	127.4	132.4	125	130	127.4	132.4
	30S	96.8	102.8	103.2	109.2	112.8	118.8	119.2	125.2	116.8	122.8	119.2	125.2
	30	107.6	113.6	114	120	123.6	129.6	130	136	127.6	133.6	130	136
	30L	131.6	137.6	138	144	147.6	153.6	154	160	151.6	157.6	154	160
	35S	108.2	114.2	114.6	120.6	–	–	–	–	–	–	–	–
	35	124.6	130.6	131	137	140.6	146.6	147	153	144.6	150.6	147	153
	35L	152.6	158.6	159	165	168.6	174.6	175	181	172.6	178.6	175	181
	45	142	148	148.4	154.4	158	164	164.4	170.4	162	168	164.4	170.4
	45L	174	180	180.4	186.4	190	196	196.4	202.4	194	200	196.4	202.4
	55	172.4	179.4	179.2	186.2	190.4	197.4	197.2	204.2	194.8	201.8	197.2	204.2
	55L	211.8	218.8	218.6	225.6	229.8	236.8	236.6	243.6	234.2	241.2	236.6	243.6
	65	219.8	226.8	226.6	233.6	237.8	244.8	244.6	251.6	242.2	249.2	244.6	251.6
	65L	272.2	279.2	279	286	290.2	297.2	297	304	294.6	301.6	297	304

- If block is assembled with MF container, the grease fitting is not supplied. If you would like to feed the grease to the block, please order side grease fitting type.

SBI High-load Linear Rail System



[Dimension of MF container]

(Unit : mm)

Reference	Model	Applied model	Block type	W	t	H	D
DF / MF	15A	SBI15	FL/FLS/FLL/HL/HLL/ HLS/SL/SLL/SLS/FV/SV	33.4	7	20.2	4
	20A	SBI20	FL/FLL/FLS SL/SLL/SLS	43.4	7	24.6	6.5
	20B		CL/CLL/FV/SV			22.6	
	20C		CLS	41.4			
	25A	SBI25	FL/FLL/FLS/HL/HLL/HLS SL/SLL/SLS	47	7	29.7	6.5
	25B		CL/CLL/FV/SV			26.7	
	30A	SBI30	FL/FLL/FLS/HL/HLL/HLS SL/SLL/SLS	59	8	34.2	6.5
	35A	SBI35	FL/FLL/HL/HLL SL/SLL	69	8	39.7	6.5
	45A	SBI45	FL/FLL/HL/HLL SL/SLL	85	8	49.7	10.5
	55A	SBI55	FL/FLL/HL/HLL SL/SLL	98	9	56	10.5
	65A	SBI65	FL/FLL SL/SLL	123	9	69	10.5

[Seal resistance]

For the maximum value of seal resistance of SBI standard type per block, in which grease is not applied.

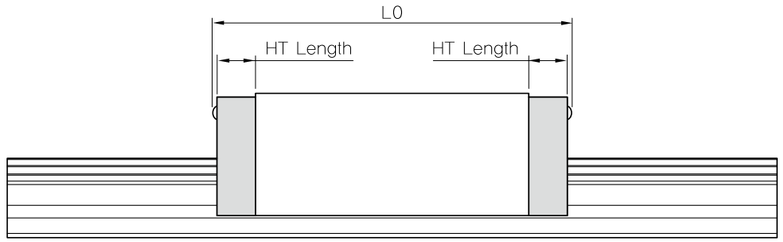
※ Scraper has no resistance because it is not contacting rail.

(Unit : N)

Model	End seal	DF	MF
SBI 15	2.0	4.7	3.5
SBI 20	2.5	4.9	3.0
SBI 25	3.0	5.5	3.5
SBI 30	3.9	5.6	3.5
SBI 35	2.5	5.7	3.7
SBI 45	3.4	5.9	4.1
SBI 55	3.5	6.2	4.2
SBI 65	3.6	6.4	4.4

SBI High-load Linear Rail System

HT high temperature end plate



(Unit : mm)

Reference	HT Length	Overall length									
		Applied model	L0	Applied model	L0	Applied model	L0	Applied model	L0	Applied model	L0
HT 15A	6.5	SBI 15V	38.3	–	–	SBI 15S	53.2	SBI 15	62.2	SBI 15L	77.8
HT 20A	8	SBI 20V	47.1	SBI 20CLS	63.2	SBI 20S	71.8	SBI 20	76.8	SBI 20L	94.4
HT 25A	8	SBI 25V	50.6	–	–	SBI 25S	81	SBI 25	90	SBI 25L	106
HT 30A	10	–	–	–	–	SBI 30S	94.8	SBI 30	105.6	SBI 30L	129.6
HT 35A	11	–	–	–	–	SBI 35S	106.2	SBI 35	122.6	SBI 35L	150.6
HT 45A	13	–	–	–	–	–	–	SBI 45	140	SBI 45L	172
HT 55A	16	–	–	–	–	–	–	SBI 55	168.5	SBI 55L	207.9
HT 65A	20	–	–	–	–	–	–	SBI 65	215.9	SBI 65L	268.3

Ordering example : **SBI25FL - HT - 2 - K1 - 800 - N**
❶ ❷ ❸ ❹ ❺ ❻

❶ Model
❷ High temperature end plate
❸ Block quantity
❹ Preload
❺ Rail length
❻ Accuracy

※ All plastic components are replace with steel or aluminum in the High Temperature Blocks.

※ Side grease fitting is not available for high temperature end plates

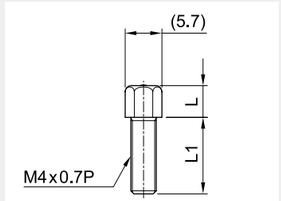
Grease and nipple specification

[Grease]

SBI uses two types of grease according to working conditions.
For details, please see the technical data for grease.

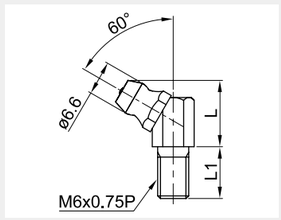
[Grease fitting Specification]

(1) Standard grease fitting (Front grease fitting)



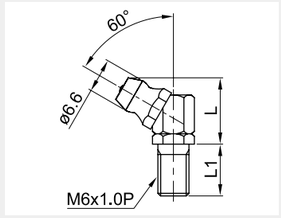
(Unit : mm)

Specification		M4x0.7P		
Applied model	Grease fitting model	Seal Symbol	L	L1
SBI 15	1N	None	7	5.5
	1D	DD, ZZ	5	9
	1Z	KK	5	11
	1F	DF,DFDD,DFZZ,DFKK	5	13



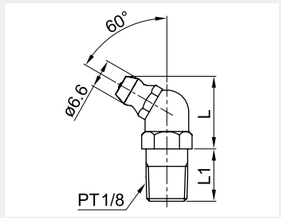
(Unit : mm)

Specification		M6x0.75P, Asia type		
Applied model	Grease fitting model	Seal Symbol	L	L1
SBI 20~35	A2N	None	13.5	7
	A2D	DD, ZZ	13.5	10
	A2Z	KK, DF	13.5	13
	A2K	DFDD, DFZZ	13.5	16
	A2F	DFKK	13.5	19



(Unit : mm)

Specification		M6x1.0P, Europe type		
Applied model	Grease fitting model	Seal Symbol	L	L1
SBI 20~35	E2N	None	13.5	7
	E2D	DD, ZZ	13.5	10
	E2Z	KK, DF	13.5	13
	E2K	DFDD, DFZZ	13.5	16
	E2F	DFKK	13.5	19

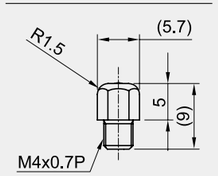


(Unit : mm)

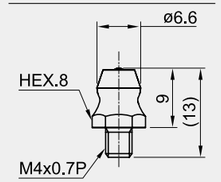
Specification		PT 1/8		
Applied model	Grease fitting model	Seal Symbol	L	L1
SBI 45~65	4N	None, DD, ZZ	17	12
	4D	KK	17	16
	4F	DF, DFDD, DFZZ, DFKK	17	23

※ We provide M6 x 0.75P for front Grease fitting of SBI 20~35.
If you need M6 x 1.0P, Please contact SBC.

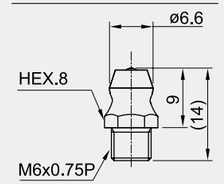
(2) Side grease fitting



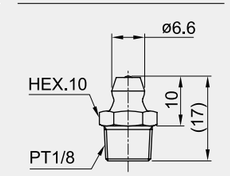
Specification	M4x0.7P
Applied model	SBI 15
Grease fitting model	S1N



Specification	M4x0.7P
Applied model	SBI 20, 25
Grease fitting model	S2N

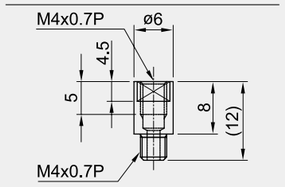


Specification	M6x0.75P
Applied model	SBI 30, 35, 45
Grease fitting model	S3N

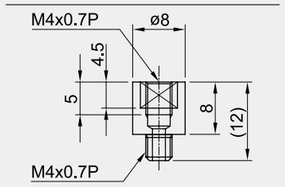


Specification	PT1/8
Applied model	SBI 55, 65
Grease fitting model	S4N

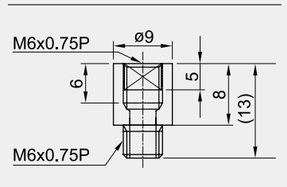
(3) FS nipple connector for side grease fitting (FL. FLL flange type only) ※Please see the page ⓑ/36 for assembling the nipple connector.



Specification	M4x0.7P
Applied model	SBI 15
Grease fitting model	S1C



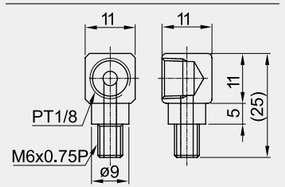
Specification	M4x0.7P
Applied model	SBI 20, 25
Grease fitting model	S2C



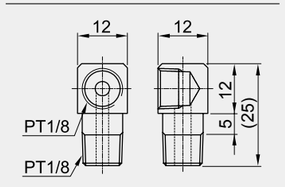
Specification	M6x0.75P
Applied model	SBI 30, 35, 45
Grease fitting model	S4C

* For size 30~45, two pieces of FS nipple connector are applied.

(4) Copper pipe



Input size	PT1/8
Output size	M6x0.75P
Applied model	SBI 20, 25, 30, 35
Grease fitting model	SB01



Input size	PT1/8
Output size	PT1/8
Applied model	SBI 45, 55, 65
Grease fitting model	SB21

SBI High-load Linear Rail System

Ordering example

[Ordering example for block]

SBI20 FL – N – DFDD – K1 – KR
[1] [2] [3] [4] [5] [6]

[1] Model

[2] Block type

[3] Position of grease fitting : None (front), N (side)

[4] Option Symbol : No symbol (standard), DF (high dust protection), MF (self lubricant), Seal (DD, ZZ, KK)
* Please refer to Option table

[5] Preload : K0, K1, K2, K3

[6] Surface treatment : No symbol (standard), KR (Block surface trearment)

※ "K3" Preload is not available for SBI 15 type

[Ordering example for rail]

SBI20 – 1000L – RR – B
[1] [2] [3] [4]

[1] Model

[2] Rail length

[3] Surface treatment : No symbol (standard), RR (Rail surface trearment)

[4] Bottom mounting : No symbol (standard), B (bottom mounting rail)

※ If only rail is ordered, N grade is available.

SBI High-load Linear Rail System

[Ordering for assembled rail and block]

SBI20 FL – N – MFDD – 2 – K1 – 5000 – J2 – N – AR – B – II
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12]

[1] Model

[2] Block type

[3] Position of grease fitting : None (front), N (side)

[4] Option Symbol : No symbol (standard), DF (high dust protection), MF (self lubricant), Seal (DD, ZZ, KK)
* Please refer to Option table

[5] Block quantity on rail

[6] Preload : K0, K1, K2 ,K3

[7] Rail length

[8] Rail connection symbol : J2 (2PCS of rail), J3 (3PCS of rail), J4 (4PCS of rail)…

[9] Accuracy : N, H, P

[10] Surface treatment : No symbol (standard), AR(Block and Rail), RR (Rail only) KR (Block only)

[11] (B) Bottom mounting : No symbol (standard), B (bottom mounting rail)

[12] Rail : number of rails per axis, None=I, 2=II…4=IV etc.

[Option symbol table]

No symbol	End seal
DD	Double seal (End seal+End seal)
ZZ	End seal+Scraper
KK	Double seal+Scraper
DF	End seal+DF
DFDD	Double seal+DF
DFZZ	End seal+DF+Scraper
DFKK	Double seal+DF+Scraper
MF	MF+End seal
MFDD	MF+Double seal
MFZZ	MF+Scraper
MFKK	MF+Double seal+Scraper
HT	High Temperatue End plate

※ We recommend block and rail assembled to be ordered where high-precision and high- rigidity are required.

※ For surface treatment, please mark according to each surface treatment symbol.

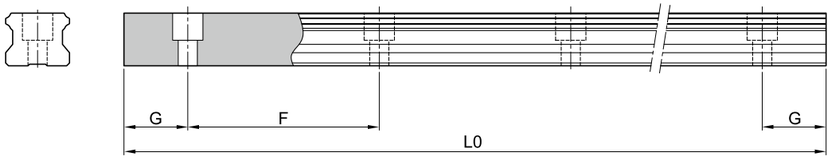
※ If special G dimension is required, please mark when you place an order.

※ Please contact SBC for high temperature order.

※ "K3" Preload is not available for SBG, SBS 15 type

SBI High-load Linear Rail System

Standard and Max. Length of SBI rail



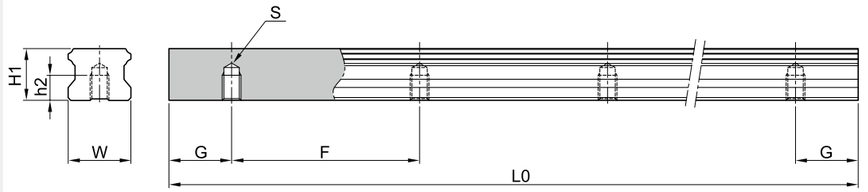
(Unit : mm)

Model number	SBI15	SBI20	SBI25	SBI30	SBI35	SBI45	SBI55	SBI65
Standard length	160	220	220	280	280	570	780	1270
	220	280	280	440	440	885	900	1570
	280	340	340	600	600	1095	1020	2020
	340	460	460	760	760	1200	1140	2470
	460	640	640	1000	1000	1410	1260	2620
	640	820	820	1240	1240	1620	1380	2920
	820	1000	1000	1480	1480	1830	1500	3070
	1000	1240	1240	1640	1640	2040	1620	—
	1240	1480	1480	1800	1800	2250	1740	—
	1480	1600	1600	2040	2040	2460	1860	—
	1600	1840	1840	2200	2200	2985	1980	—
	1960	2080	2080	2520	2520	3510	2220	—
	2200	2200	2200	2840	2840	—	2580	—
	2500	2500	2500	3000	3000	—	2940	—
	2860	2960	2980	3480	3480	—	3540	—
	—	3520	3520	—	—	—	—	—
	—	4000	4000	—	—	—	—	—
F	60	60	60	80	80	105	120	150
G	20	20	20	20	20	22.5	30	35
L0(Max length)	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000

* If the maximum length exceeds this size, butt joints can be supplied.
* For more information about butt jointing, please refer to the page of safety design.
* If the G is not standard, please indicate it in the order sheet.

SBI High-load Linear Rail System

Bottom mounting rail (SBI-B type)



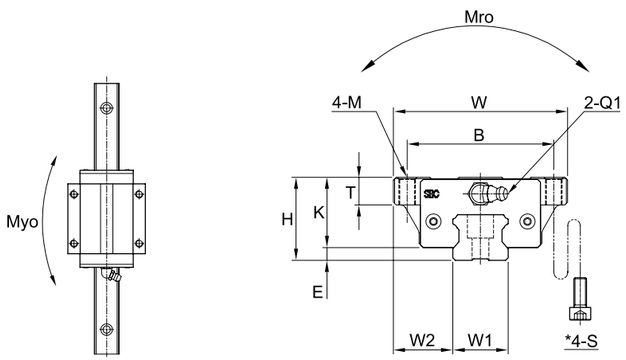
(Unit : mm)

Model number	W1	H1	S	h2	G	F	L0 (Max length)	Weight (kg/m)
SBI 15-B	15	13	M5X0.8	8	20	60	3,000	1.39
SBI 20-B	20	16.5	M6	9	20	60	4,000	2.37
SBI 25-B	23	20	M6	9	20	60	4,000	3.26
SBI 30-B	28	23	M8	12	20	80	4,000	4.63
SBI 35-B	34	26	M8	12	20	80	4,000	6.45
SBI 45-B	45	32	M12	18	22.5	105	4,000	10.49

* If the maximum length exceeds this size, please contact SBC.

SBI High-load Linear Rail System

SBI-FL/FLS/FLL

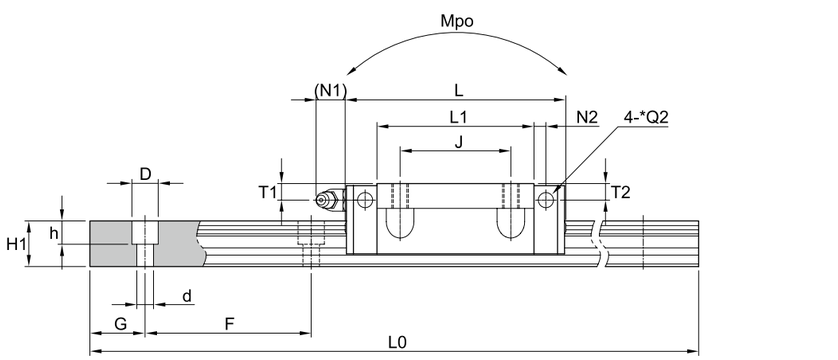


Model	Mounting dimension				Block dimensions													
	H	W	L	E	Mounting tap hole				L1	T±1	K	Grease fitting						
					B	J	M	*S				T1	N1	T2	N2	Q1	*Q2	
SBI15 FLS	24	47	56.8	3	38	30	M5	M4	38.2	11	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI15 FL	24	47	63.8	3	38	30	M5	M4	45.2	9	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI15 FLL	24	47	79.4	3	38	30	M5	M4	60.8	9	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI20 FLS	30	63	73.8	4.6	53	40	M6	M5	51.8	12	25.4	6	12	5.8	5	M6x0.75	Ø3.5	
SBI20 FL	30	63	78.8	4.6	53	40	M6	M5	56.8	12	25.4	6	12	5.8	5	M6x0.75	Ø3.5	
SBI20 FLL	30	63	96.4	4.6	53	40	M6	M5	74.4	12	25.4	6	12	5.8	5	M6x0.75	Ø3.5	
SBI25 FLS	36	70	83	5.5	57	45	M8	M6	61	13	30.5	6	12	5	5	M6x0.75	Ø3.5	
SBI25 FL	36	70	92	5.5	57	45	M8	M6	70	13	30.5	6	12	5	5	M6x0.75	Ø3.5	
SBI25 FLL	36	70	108	5.5	57	45	M8	M6	86	13	30.5	6	12	5	5	M6x0.75	Ø3.5	
SBI30 FLS	42	90	96.8	7	72	52	M10	M8	68.8	15.5	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI30 FL	42	90	107.6	7	72	52	M10	M8	79.6	15.5	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI30 FLL	42	90	131.6	7	72	52	M10	M8	103.6	15.5	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI35 FLS	48	100	108.2	8	82	62	M10	M8	78.2	15	40	8	12	8	6	M6x0.75	Ø5.7	
SBI35 FL	48	100	124.6	7.5	82	62	M10	M8	94.6	15	40.5	8	12	8	6	M6x0.75	Ø5.7	
SBI35 FLL	48	100	152.6	7.5	82	62	M10	M8	122.6	15	40.5	8	12	8	6	M6x0.75	Ø5.7	
SBI45 FL	60	120	142	9	100	80	M12	M10	108	18	51	10.5	13.5	9.3	6.5	PT1/8	Ø5.7	
SBI45 FLL	60	120	174	9	100	80	M12	M10	140	18	51	10.5	13.5	9.3	6.5	PT1/8	Ø5.7	
SBI55 FL	70	140	172.4	12	116	95	M14	M12	131	22	58	12	13	12	8	PT1/8	Ø8.7	
SBI55 FLL	70	140	211.8	12	116	95	M14	M12	170.4	22	58	12	13	12	8	PT1/8	Ø8.7	
SBI65 FL	90	170	219.8	19	142	110	M16	M14	170.4	26	71	14	13	14	10	PT1/8	Ø8.7	
SBI65 FLL	90	170	272.2	19	142	110	M16	M14	222.8	26	71	14	13	14	10	PT1/8	Ø8.7	

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *S: Bolt size for bottom mounting type of block.

SBI High-load Linear Rail System



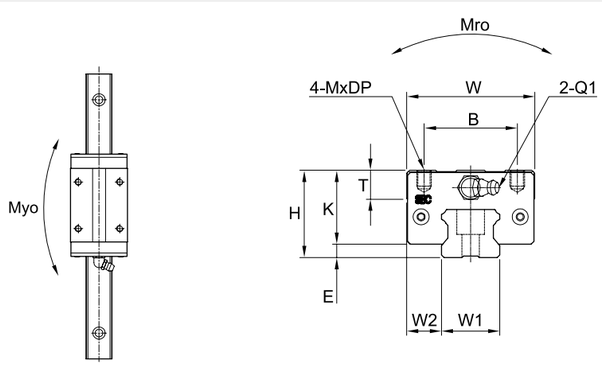
(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [kN • m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max length of rail						Block [kg]	Rail [kg/m]
				d	D	h			C	Co	Mro	Mpo	Myo		
15	16	13	60	4.5	7.5	5.5	20	3000	12.3	18.3	0.13	0.08	0.08	0.20	1.3
15	16	13	60	4.5	7.5	5.5	20	3000	14.1	24.1	0.16	0.17	0.17	0.24	1.3
15	16	13	60	4.5	7.5	5.5	20	3000	17.1	31.7	0.21	0.29	0.29	0.30	1.3
20	21.5	16.5	60	6	9.5	8.5	20	4000	20.2	29.1	0.29	0.18	0.18	0.44	2.2
20	21.5	16.5	60	6	9.5	8.5	20	4000	22.2	38.2	0.36	0.33	0.33	0.46	2.2
20	21.5	16.5	60	6	9.5	8.5	20	4000	27.9	50	0.47	0.56	0.56	0.60	2.2
23	23.5	20	60	7	11	9	20	4000	28.9	42.8	0.49	0.32	0.32	0.66	3
23	23.5	20	60	7	11	9	20	4000	31.5	52.1	0.56	0.56	0.56	0.75	3
23	23.5	20	60	7	11	9	20	4000	36.7	64.4	0.69	0.84	0.84	0.80	3
28	31	23	80	9	14	12	20	4000	39.2	57.7	0.80	0.49	0.49	1.08	4.25
28	31	23	80	9	14	12	20	4000	42.8	65.4	0.85	0.77	0.77	1.25	4.25
28	31	23	80	9	14	12	20	4000	51.3	84.7	1.10	1.30	1.30	1.65	4.25
34	33	26	80	9	14	12	20	4000	52.0	73.3	1.24	0.71	0.71	1.53	6.02
34	33	26	80	9	14	12	20	4000	59.5	89.1	1.42	1.28	1.28	1.92	6.02
34	33	26	80	9	14	12	20	4000	71.3	115.3	1.83	2.12	2.12	2.43	6.02
45	37.5	32	105	14	20	17	22.5	4000	79.2	116.3	2.48	1.90	1.90	3.25	9.77
45	37.5	32	105	14	20	17	22.5	4000	94.8	150.5	3.21	3.14	3.14	4.40	9.77
53	43.5	38	120	16	23	20	30	4000	127.3	181.8	4.81	2.97	2.97	5.08	13.72
53	43.5	38	120	16	23	20	30	4000	147.9	224.5	5.95	4.78	4.78	6.58	13.72
63	53.5	53	150	18	26	22	35	4000	188.3	261.7	8.24	5.57	5.57	10.17	23.17
63	53.5	53	150	18	26	22	35	4000	232.5	354.1	11.15	9.86	9.86	13.29	23.17

❸ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside. When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

SBI-SLS/SL/SLL

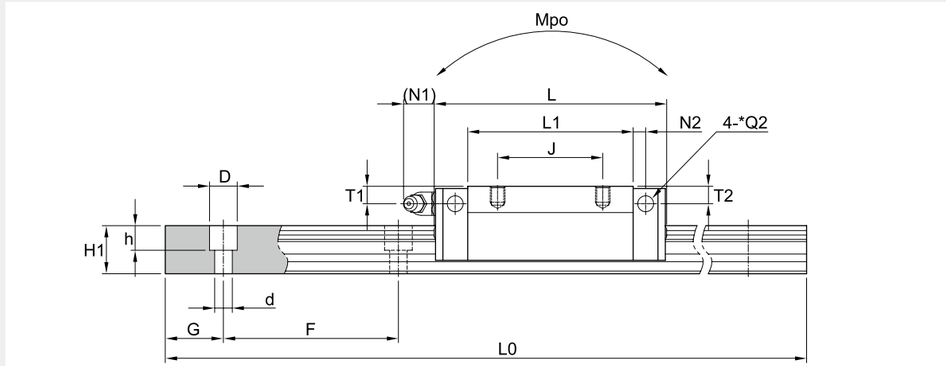


Model	Mounting dimension				Block dimensions												
					Mounting tap hole				L1	T±1	K	Grease fitting					
	H	W	L	E	B	J	M	DP				T1	N1	T2	N2	Q1	*Q2
SBI15 SLS	28	34	56.8	3	26	26	M4	5	38.2	10	25	8.5	5.5	7.8	3.8	M4x0.7	Ø3.5
SBI15 SL	28	34	63.8	3	26	26	M4	5	45.2	10	25	8.5	5.5	7.8	3.8	M4x0.7	Ø3.5
SBI15 SLL	28	34	79.4	3	26	34	M4	5	60.8	10	25	8.5	5.5	7.8	3.8	M4x0.7	Ø3.5
SBI20 SLS	30	44	73.8	4.6	32	36	M5	5	51.8	10	25.4	6	12	5.8	5	M6x0.75	Ø3.5
SBI20 SL	30	44	78.8	4.6	32	36	M5	5	56.8	10	25.4	6	12	5.8	5	M6x0.75	Ø3.5
SBI20 SLL	30	44	96.4	4.6	32	50	M5	5	74.4	10	25.4	6	12	5.8	5	M6x0.75	Ø3.5
SBI25 SLS	40	48	83	5.5	35	35	M6	8	61	16	34.5	10	12	9	5	M6x0.75	Ø3.5
SBI25 SL	40	48	92	5.5	35	35	M6	8	70	16	34.5	10	12	9	5	M6x0.75	Ø3.5
SBI25 SLL	40	48	108	5.5	35	50	M6	8	86	16	34.5	10	12	9	5	M6x0.75	Ø3.5
SBI30 SLS	45	60	96.8	7	40	40	M8	10	68.8	12	38	11.5	12	10.8	5	M6x0.75	Ø5.7
SBI30 SL	45	60	107.6	7	40	40	M8	10	79.6	12	38	11.5	12	10.8	5	M6x0.75	Ø5.7
SBI30 SLL	45	60	131.6	7	40	60	M8	10	103.6	12	38	11.5	12	10.8	5	M6x0.75	Ø5.7
SBI35 SLS	55	70	108.2	8	50	50	M8	10	78.2	15	47	15	12	15	6	M6x0.75	Ø5.7
SBI35 SL	55	70	124.6	7.5	50	50	M8	10	94.6	15	47.5	15	12	15	6	M6x0.75	Ø5.7
SBI35 SLL	55	70	152.6	7.5	50	72	M8	10	122.6	15	47.5	15	12	15	6	M6x0.75	Ø5.7
SBI45 SL	70	86	142	9	60	60	M10	13	108	17	61	20.5	13.5	19.3	6.5	PT1/8	Ø5.7
SBI45 SLL	70	86	174	9	60	80	M10	13	140	17	61	20.5	13.5	19.3	6.5	PT1/8	Ø5.7
SBI55 SL	80	100	172.4	12	75	75	M12	18	131	21	68	22	13	22	8	PT1/8	Ø8.7
SBI55 SLL	80	100	211.8	12	75	95	M12	18	170.4	21	68	22	13	22	8	PT1/8	Ø8.7
SBI65 SL	90	126	219.8	19	76	70	M16	16	170.4	26	71	14	13	14	10	PT1/8	Ø8.7
SBI65 SLL	90	126	272.2	19	76	120	M16	16	222.8	26	71	14	13	14	10	PT1/8	Ø8.7

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside.
When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

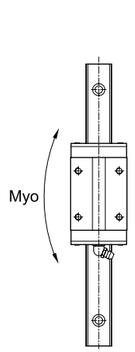


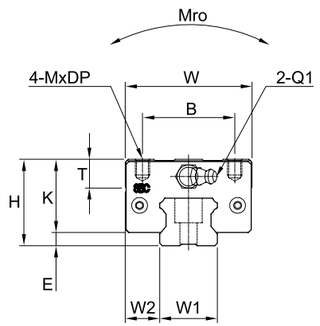
(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [kN·m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail					Block [kg]	Rail [kg/m]
				d	D	h			C	Co	Mro	Mpo	Myo		
15	9.5	13	60	4.5	7.5	5.5	20	3000	12.3	18.3	0.13	0.08	0.08	0.19	1.3
15	9.5	13	60	4.5	7.5	5.5	20	3000	14.1	24.1	0.16	0.17	0.17	0.23	1.3
15	9.5	13	60	4.5	7.5	5.5	20	3000	17.1	31.7	0.21	0.29	0.29	0.31	1.3
20	12	16.5	60	6	9.5	8.5	20	4000	20.2	29.1	0.29	0.18	0.18	0.33	2.2
20	12	16.5	60	6	9.5	8.5	20	4000	22.2	38.2	0.36	0.33	0.33	0.36	2.2
20	12	16.5	60	6	9.5	8.5	20	4000	27.9	50	0.47	0.56	0.56	0.47	2.2
23	12.5	20	60	7	11	9	20	4000	28.9	42.8	0.49	0.32	0.32	0.58	3
23	12.5	20	60	7	11	9	20	4000	31.5	52.1	0.56	0.56	0.56	0.68	3
23	12.5	20	60	7	11	9	20	4000	36.7	64.4	0.69	0.84	0.84	0.82	3
28	16	23	80	9	14	12	20	4000	39.2	57.7	0.80	0.49	0.49	0.92	4.25
28	16	23	80	9	14	12	20	4000	42.8	65.4	0.85	0.77	0.77	1.06	4.25
28	16	23	80	9	14	12	20	4000	51.3	84.7	1.10	1.30	1.30	1.36	4.25
34	18	26	80	9	14	12	20	4000	52.0	73.3	1.24	0.71	0.71	1.48	6.02
34	18	26	80	9	14	12	20	4000	59.5	89.1	1.42	1.28	1.28	1.82	6.02
34	18	26	80	9	14	12	20	4000	71.3	115.3	1.83	2.12	2.12	2.32	6.02
45	20.5	32	105	14	20	17	22.5	4000	79.2	116.3	2.48	1.90	1.90	3.08	9.77
45	20.5	32	105	14	20	17	22.5	4000	94.8	150.5	3.21	3.14	3.14	4.23	9.77
53	23.5	38	120	16	23	20	30	4000	127.3	181.8	4.81	2.97	2.97	5.04	13.72
53	23.5	38	120	16	23	20	30	4000	147.9	224.5	5.95	4.78	4.78	5.82	13.72
63	31.5	53	150	18	26	22	35	4000	188.3	261.7	8.24	5.57	5.57	9.10	23.17
63	31.5	53	150	18	26	22	35	4000	232.5	354.1	11.15	9.86	9.86	11.98	23.17

SBI High-load Linear Rail System

SBI-HL/HLS/HLL



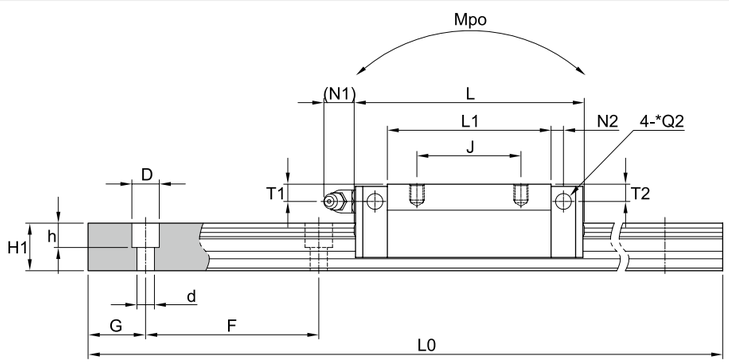


Model	Mounting dimension				Block dimensions													
	H	W	L	E	Mounting tap hole				L1	T 1	K	Grease fitting						
					B	J	M	DP				T1	N1	T2	N2	Q1	*Q2	
SBI15 HLS	24	34	56.8	3	26	26	M4	4	38.2	6	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI15 HL	24	34	63.8	3	26	26	M4	4	45.2	6	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI15 HLL	24	34	79.4	3	26	34	M4	4	60.8	6	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5	
SBI25 HLS	36	48	83	5.5	35	35	M6	6	61	12	30.5	6	12	5	5.5	M6x0.75	Ø3.5	
SBI25 HL	36	48	92	5.5	35	35	M6	6	70	12	30.5	6	12	5	5.5	M6x0.75	Ø3.5	
SBI25 HLL	36	48	108	5.5	35	50	M6	6	86	12	30.5	6	12	5	5.5	M6x0.75	Ø3.5	
SBI30 HLS	42	60	96.8	7	40	40	M8	8	68.8	12	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI30 HL	42	60	107.6	7	40	40	M8	8	79.6	12	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI30 HLL	42	60	131.6	7	40	60	M8	8	103.6	12	35	8.5	12	7.8	5	M6x0.75	Ø5.7	
SBI35 HLS	48	70	108.2	8	50	50	M8	8	78.2	15	40	8	12	8	6	M6x0.75	Ø5.7	
SBI35 HL	48	70	124.6	7.5	50	50	M8	8	94.6	15	40.5	8	12	8	6	M6x0.75	Ø5.7	
SBI35 HLL	48	70	152.6	7.5	50	72	M8	8	122.6	15	40.5	8	12	8	6	M6x0.75	Ø5.7	
SBI45 HL	60	86	142	9	60	60	M10	10	108	17	51	10.5	13.5	9.3	6.5	PT1/8	Ø5.7	
SBI45 HLL	60	86	174	9	60	80	M10	10	140	17	51	10.5	13.5	9.3	6.5	PT1/8	Ø5.7	
SBI55 HL	70	100	172.4	12	75	75	M12	12	131	21	58	12	13	12	8	PT1/8	Ø8.7	
SBI55 HLL	70	100	211.8	12	75	95	M12	12	170.4	21	58	12	13	12	8	PT1/8	Ø8.7	

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside.
When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

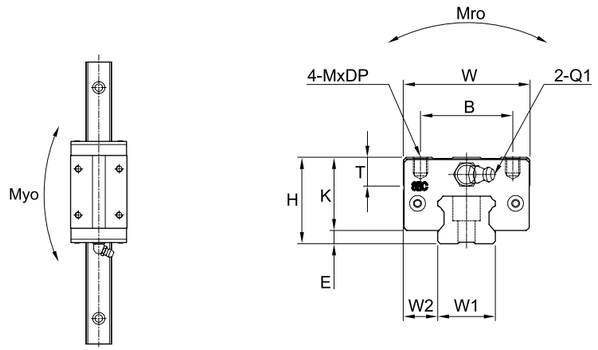


(Unit : mm)

Rail dimension									Basic load rating [kN]		Permissible static moment [kN・m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail	C	Co	Mro	Mpo	Myo	Block [kg]	Rail [kg/m]
				d	D	h									
15	9.5	13	60	4.5	7.5	5.5	20	3000	12.3	18.3	0.13	0.08	0.08	0.15	1.3
15	9.5	13	60	4.5	7.5	5.5	20	3000	14.1	24.1	0.16	0.17	0.17	0.18	1.3
15	9.5	13	60	4.5	7.5	5.5	20	3000	17.1	31.7	0.21	0.29	0.29	0.24	1.3
23	12.5	20	60	7	11	9	20	4000	28.9	42.8	0.49	0.32	0.32	0.47	3
23	12.5	20	60	7	11	9	20	4000	31.5	52.1	0.56	0.56	0.56	0.57	3
23	12.5	20	60	7	11	9	20	4000	36.7	64.4	0.69	0.84	0.84	0.70	3
28	16	23	80	9	14	12	20	4000	39.2	57.7	0.80	0.49	0.49	0.80	4.25
28	16	23	80	9	14	12	20	4000	42.8	65.4	0.85	0.77	0.77	0.95	4.25
28	16	23	80	9	14	12	20	4000	51.3	84.7	1.10	1.30	1.30	1.22	4.25
34	18	26	80	9	14	12	20	4000	52.0	73.3	1.24	0.71	0.71	1.35	6.02
34	18	26	80	9	14	12	20	4000	59.5	89.1	1.42	1.28	1.28	1.87	6.02
34	18	26	80	9	14	12	20	4000	71.3	115.3	1.83	2.12	2.12	2.04	6.02
45	20.5	32	105	14	20	17	22.5	4000	79.2	116.3	2.48	1.90	1.90	2.80	9.77
45	20.5	32	105	14	20	17	22.5	4000	94.8	150.5	3.21	3.14	3.14	3.29	9.77
53	23.5	38	120	16	23	20	30	4000	127.3	181.8	4.81	2.97	2.97	4.42	13.72
53	23.5	38	120	16	23	20	30	4000	147.9	224.5	5.95	4.78	4.78	5.82	13.72

SBI High-load Linear Rail System

SBI-CL/CLS/CLL

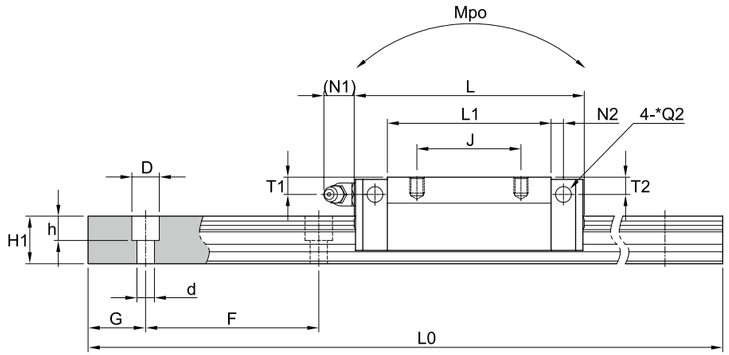


Model	Mounting dimension				Block dimensions											
					Mounting tap hole							Grease fitting				
	H	W	L	E	B	J	M	DP	L1	T±1	K	T1	N1	T2	N2	Q1	*Q2
SBI20 CLS	28	42	65.2	4.6	32	32	M5	5	43.2	7.8	23.4	4.8	12	4.3	5	M6x0.75	Ø3.5
SBI20 CL	28	44	78.8	4.6	32	32	M5	5	56.8	7.8	23.4	4.8	12	3.8	5	M6x0.75	Ø3.5
SBI20 CLL	28	44	96.4	4.6	32	50	M5	5	74.4	7.8	23.4	4.8	12	3.8	5	M6x0.75	Ø3.5
SBI25 CL	33	48	92	5.5	35	35	M6	6	70	9	27.5	5.4	12	5.4	5	M6x0.75	Ø3.5
SBI25 CLL	33	48	108	5.5	35	50	M6	6	86	9	27.5	5.4	12	5.4	5	M6x0.75	Ø3.5

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside.
When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

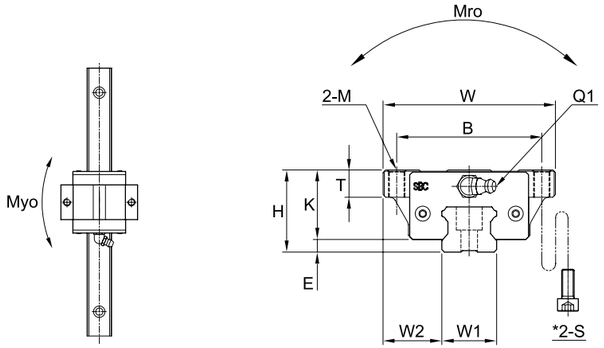


(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [kN・m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail L0						Block [kg]	Rail [kg/m]
				d	D	h			C	Co	Mro	Mpo	Myo		
20	11	16.5	60	6	9.5	8.5	20	4000	19.1	27.0	0.27	0.15	0.15	0.23	2.2
20	12	16.5	60	6	9.5	8.5	20	4000	22.2	38.2	0.36	0.33	0.33	0.32	2.2
20	12	16.5	60	6	9.5	8.5	20	4000	27.9	50	0.47	0.56	0.56	0.41	2.2
23	12.5	20	60	7	11	9	20	4000	31.5	52.1	0.56	0.56	0.56	0.49	3
23	12.5	20	60	7	11	9	20	4000	36.7	64.4	0.69	0.84	0.84	0.57	3

SBI High-load Linear Rail System

SBI-FV



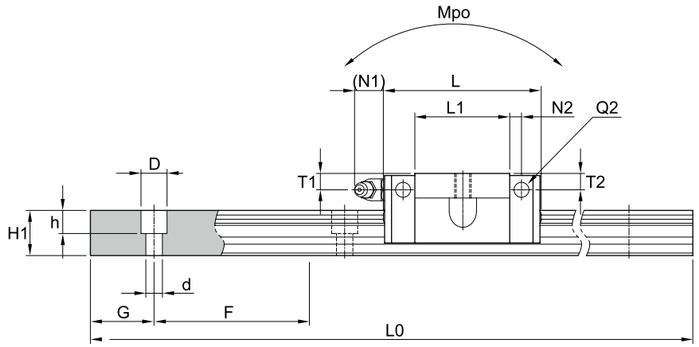
Model	Mounting dimension				Block dimensions											
	H	W	L	E	Mounting tap hole			L1	T±1	K	Grease fitting					
					B	M	*S				T1	N1	T2	N2	Q1	*Q2
SBI15 FV	24	47	39.9	3	38	M5	M4	21.3	9	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5
SBI20 FV	28	63	49.1	4.6	53	M6	M5	27.1	12	23.4	4.8	12	3.8	5	M6x0.75	Ø3.5
SBI25 FV	33	70	52.6	5.5	57	M8	-	30.6	13	27.5	5.4	12	5.4	5	M6x0.75	Ø3.5

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *S: Bolt size for bottom mounting type of block.
*SBI25FV type can not be mounted from bottom.

❸ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside.
When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

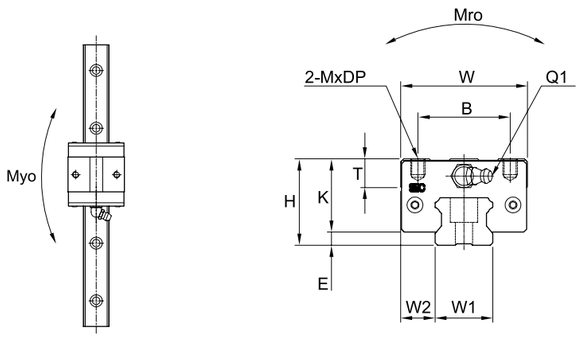


(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [kN・m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail L0						
				d	D	h			C	Co	Mro	Mpo	Myo	Block [kg]	Rail [kg/m]
15	16	13	60	4.5	7.5	5.5	20	3000	5.8	12.8	0.05	0.03	0.03	0.11	1.3
20	21.5	16.5	60	6	9.5	8.5	20	4000	9.4	20.2	0.15	0.11	0.11	0.23	2.2
23	23.5	20	60	7	11	9	20	4000	12.4	26.1	0.21	0.14	0.14	0.32	3

SBI High-load Linear Rail System

SBI-SV

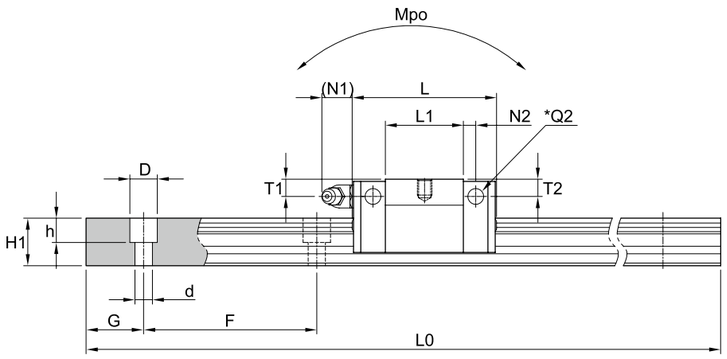


Model	Mounting dimension				Block dimensions											
	H	W	L	E	Mounting tap hole			L1	T±	K	Grease fitting					
					B	M	DP				T1	N1	T2	N2	Q1	*Q2
SBI15 SV	24	34	39.9	3	26	M4	4	21.3	6	21	4.5	5.5	3.8	3.8	M4x0.7	Ø3.5
SBI20 SV	28	44	49.1	4.6	32	M5	5	27.1	7.8	23.4	4.8	12	3.8	5	M6x0.75	Ø3.5
SBI25 SV	33	48	52.6	5.5	35	M6	6	30.6	9	27.5	5.4	12	5.4	5	M6x0.75	Ø3.5

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ *Q2: The hole of side grease nipple is not made to prevent a foreign substance from going into inside.
When you order the side grease nipple, we build it by ourselves.

SBI High-load Linear Rail System

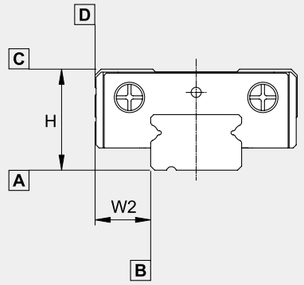


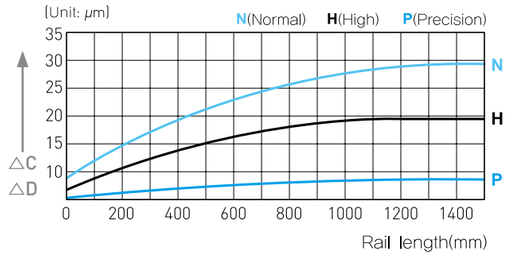
(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [kN・m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail L0						Block [kg]	Rail [kg/m]
				d	D	h			C	Co	Mro	Mpo	Myo		
15	9.5	13	60	4.5	7.5	5.5	20	3000	5.8	12.8	0.05	0.03	0.03	0.10	1.3
20	12	16.5	60	6	9.5	8.5	20	4000	9.4	20.2	0.15	0.11	0.11	0.17	2.2
23	12.5	20	60	7	11	9	20	4000	12.4	26.1	0.21	0.14	0.14	0.24	3

Miniature Linear Rail System

Accuracy





(Unit : mm)

Item	N	H	P
Tolerance for the height **H**	±0.04	±0.02	±0.01
Tolerance for the rail-to-block lateral distance **W2**	±0.04	±0.025	±0.015
Tolerance for the height **H** difference among blocks	0.03	0.015	0.007
Tolerance for rail-to-block lateral distance **W2** distance among blocks	0.03	0.015	0.007
Running parallelism of surface **C** with surface **A**	△C		
Running parallelism of surface **D** with surface **B**	△D		

- **N** : Normal
- **H** : High
- **P** : Precision

[Preload]

Reference	Volume of preload
K1	Max. 0.02C
K2	0.04 ~ 0.06C

- C(kN) : Basic dynamic load rating

[Seal resistance]

(Unit : N)

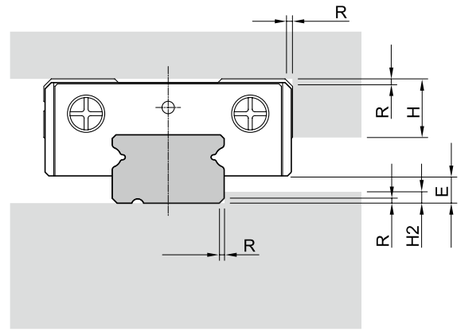
Reference	SBM/SBML	SBMW
07	0.08	-
09	0.2	0.8
12	0.59	1.1
15	1.18	1.3

[Grease]

SBM(L), SBMW Uses two types of grease according to working conditions.
For details, please see the technical data for grease.

Miniature Linear Rail System

Shoulder height and fillet radius R

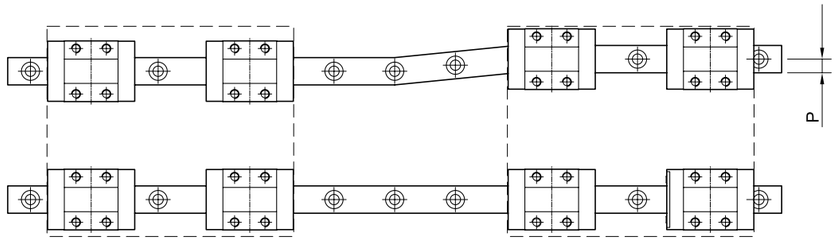


(Unit : mm)

Model number	Fillet radius R	Shoulders height H1	Shoulders height H2	E
SBM07	0.2	3	1.2	1.5
SBM(L)09	0.3	3	1.9	2
SBM(L)12	0.3	4	2	3
SBM(L)15	0.3	5	2.5	4
SBMW(L)09	0.3	3	3.4	3.7
SBMW(L)12	0.3	4	3.7	4
SBMW(L)15	0.3	5	3.4	3.7

Miniature Linear Rail System

Permissible tolerance (P) of parallelism



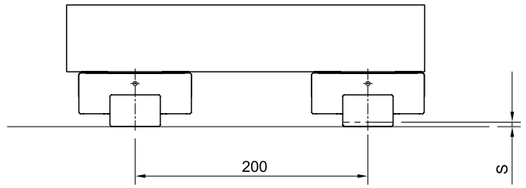
(Unit : mm)

Model size	K1	K2
07	0.003	-
09	0.004	0.003
12	0.009	0.005
15	0.01	0.006

Linear Rail System

Miniature Linear Rail System

Permissible tolerance (S) of two level offset



(Unit : mm)

Model size	K1	K2
07	0.025	-
09	0.035	0.006
12	0.05	0.012
15	0.06	0.02

[Ordering example for block]

SBM09 – K1 – KR
[1] [2] [3]

[1] Model : SBM, SBML, SBMW

[2] Preload : K1, K2

[3] Surface treatment : No symbol (standard), KR (Block surface trearment)

[Ordering example for rail]

SBM09 – 600L – RR – B
[1] [2] [3] [4]

[1] Model : SBM, SBMW

[2] Rail length

[3] Surface treatment : No symbol (standard), RR (Rail surface trearment)

[4] Through tap hole rail : Standard (No symbol)

※ If only rail is ordered, N grade is available.

[Ordering for assembled rail and block]

SBM09 – 2 – K1 – 600 J2 – N – AR – B – II
[1] [2] [3] [4] [5] [6] [7] [8] [9]

[1] Model : SBM, SBML, SBMW, SBMWL

[2] Block quantity on rail

[3] Preload : K1, K2

[4] Rail length

[5] Rail connection symbol : J2 (2PCS of rail), J3 (3PCS of rail), J4 (4PCS of rail)…

[6] Accuracy : N, H, P

[7] Surface treatment : No symbol (standard), AR(Block and Rail), RR (Rail only) KR (Block only)

[8] Through tap hole rail : Standard (No symbol)

[9] Rail : number of rails per axis, None=I, 2=II…4=IV etc.

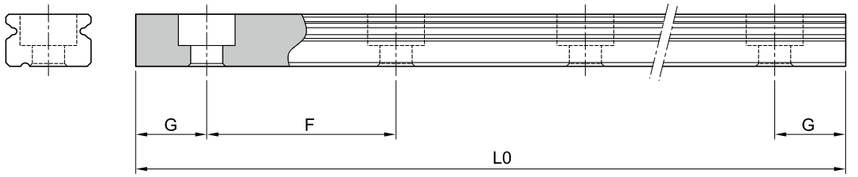
※ We recommend block and rail assembled to be ordered where high-precision and high-rigidity are required.

※ For surface treatment, please mark according to each surface treatment symbol.

※ If special G dimension is required, please mark when you place an order.

※ Please refer to a next page for standard “G dimension”

Standard and Max length



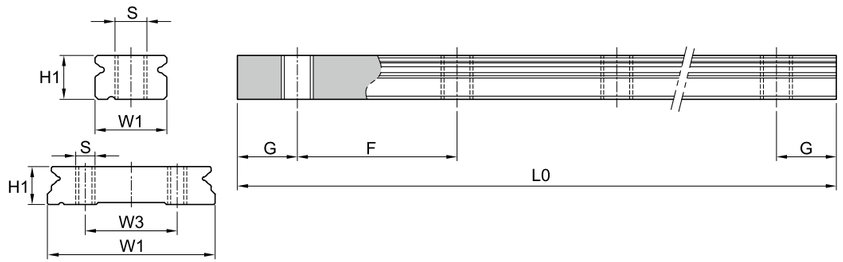
(Unit : mm)

Model number	SBM07	SBM09	SBM12	SBM15	SBMW09	SBMW12	SBMW15
Standard length	40	55	70	70	50	70	110
	55	75	95	110	80	110	150
	70	95	120	150	110	150	190
	85	115	145	190	140	190	230
	100	135	170	230	170	230	270
	115	155	195	270	200	270	350
	130	175	220	310	260	350	430
	160	215	245	350	320	430	510
	190	255	270	390	380	510	590
	220	295	320	430	440	590	670
	250	355	395	470	500	670	750
	280	415	470	590	560	750	830
		495	545	670	620	830	910
		535	620	830	680	910	990
		615	695	910	740	990	1070
		675	770	990	800	1070	1190
		715	870	1070	860	1190	
		735	970	1190	920		
		795	1020		980		
		875	1195		1040		
		955			1100		
		995			1190		
		1035					
		1115					
		1195					
F	15	20	25	40	30	40	40
G	5	7.5	10	15	10	15	15
L0(Max length)	490	1195	1195	1190	1190	1190	1190

* SBM, SBML use same rail.

* If special G dimension is required, please mark when you place an order.

Miniature through tap hole rail

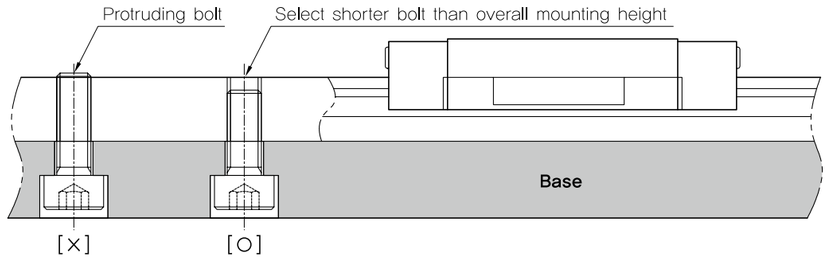


(Unit : mm)

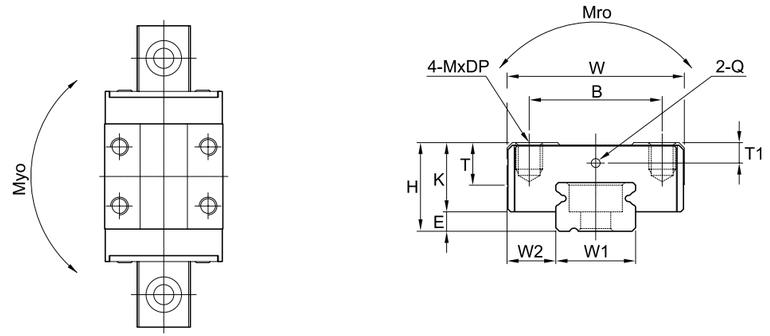
Model	W1	W3	H1	S	G	F	L0 (Max length)	Mass (kg/m)
SBM 07-B	7	-	4.7	M3x0.5P	5	15	490	0.22
SBM 09-B	9	-	5.5	M4x0.7P	7.5	20	1195	0.32
SBM 12-B	12	-	7.5	M4x0.7P	10	25	1195	0.32
SBM 15-B	15	-	9.5	M4x0.7P	15	40	1190	0.59
SBMW 09-B	18	-	7.5	M4x0.7P	10	30	1190	0.99
SBMW 12-B	24	-	8.5	M5x0.8P	15	40	1190	1.42
SBMW 15-B	42	23	9.5	M5x0.8P	15	40	1190	2.93

Caution for mounting miniature through tap hole rail

If the mounting bolt is longer than overall mounting height, the bolt can protrude which can cause tinterference with the seal or bearing itself. Therefore, make sure the appropriate bolt selection.

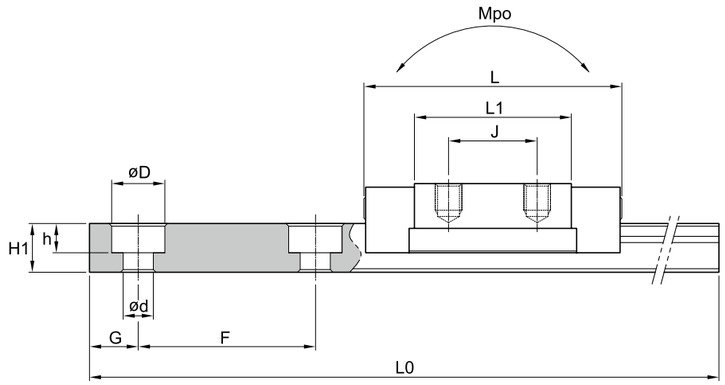


SBM/SBML



Model	Mounting dimension				Block dimensions								
	H	W	L	E	Mounting tap hole				L1	T	K	Greasing hole	
					B	J	M	DP				T1	Q
SBM 07	8	17	22.9	1.5	12	8	M2	2.5	13.5	3.3	6.5	1.6	Ø1
SBML 07	8	17	32.4	1.5	12	13	M2	2.5	23	3.3	6.5	1.6	Ø1
SBM 09	10	20	30.1	2.0	15	10	M3	3	19.3	4.5	8	2.3	Ø1
SBML 09	10	20	39.6	2.0	15	16	M3	3	28.8	4.5	8	2.3	Ø1
SBM 12	13	27	34.6	3	20	15	M3	3.5	21	5.5	10	2.7	Ø1
SBML 12	13	27	44.3	3	20	20	M3	3.5	30.7	5.5	10	2.7	Ø1
SBM 15	16	32	43	4	25	20	M3	4	25.4	6.5	12	3.1	Ø1
SBML 15	16	32	58.8	4	25	25	M3	4	41.2	6.5	12	3.1	Ø1

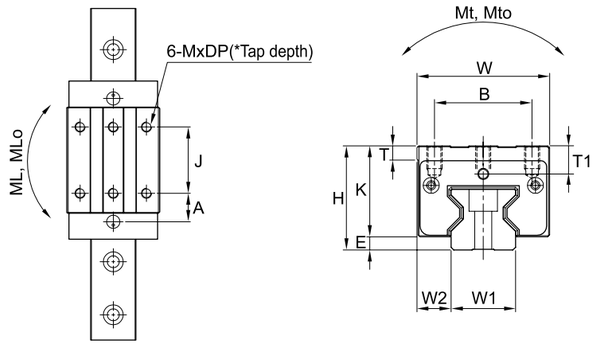
❶ C (Basic dynamic load rating), Co (Basic static load rating)



(Unit : mm)

Rail dimension								Basic load rating [kN]		Permissible static moment [N • m]			Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail L0						Block [kg]	Rail [kg/m]
				d	D	h			C	Co	Mro	Mpo	Myo		
7	5	4.7	15	2.6	4.3	2.3	5	490	0.88	1.37	4.9	2.94	2.94	0.006	0.23
7	5	4.7	15	2.6	4.3	2.3	5	490	1.59	2.5	8.82	7.84	7.84	0.015	0.23
9	5.5	5.5	20	4	6	3.3	7.5	1195	1.42	2.9	10.39	5.1	5.1	0.013	0.32
9	5.5	5.5	20	4	6	3.3	7.5	1195	2.59	3.92	18.33	17.54	14.54	0.023	0.32
12	7.5	7.5	25	4	6	4.5	10	1195	2.46	3.62	14.7	8.04	8.72	0.029	0.59
12	7.5	7.5	25	4	6	4.5	10	1195	4.21	6.56	26.66	24.01	26.07	0.043	0.59
15	8.5	9.5	40	4	6	4.5	15	1190	4.02	5.97	37.24	16.46	17.93	0.052	0.99
15	8.5	9.5	40	4	6	4.5	15	1190	7.15	10.68	53.02	49.3	53.51	0.079	0.99

MG-SC/SL

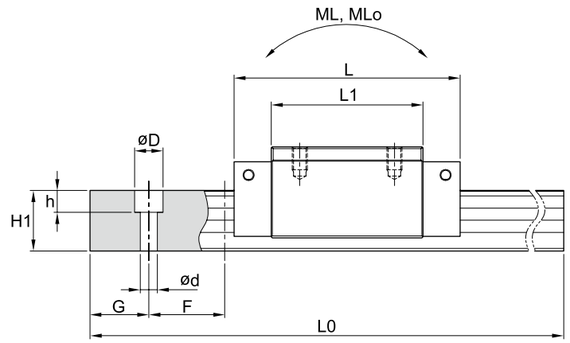


Model	Mounting dimension				Block dimension								
	H	W	L	E	Mounting tap hole				L1	T	K	T1	A
					B	J	M	DP					
MG25 SC	40	48	90.2	6.5	35	35	M6	9	62	7.5	33.5	9.5	19
MG25 SL	40	48	109.7	6.5	35	50	M6	9	81.5	7.5	33.5	9.5	21.2
MG35 SC	55	70	119.3	7	50	50	M8	12	80	8	48	14.9	21.5
MG35 SL	55	70	142.3	7	50	72	M8	12	103	8	48	14.9	22
MG45 SC	70	86	147.3	10	60	60	M10	18	101.3	10	60	18	27.6
MG45 SL	70	86	179.8	10	60	80	M10	18	133.8	10	60	18	33.9
MG55 SC	80	100	173	13	75	75	M12	19	120	12	67	19	31.5
MG55 SL	80	100	215	13	75	95	M12	19	162	12	67	19	42
MG65 SC	90	126	221.8	12	76	70	M16	15	159.8	15.5	78	22	49
MG65 SL	90	126	272.3	12	76	120	M16	15	210.3	15.5	78	22	49.2

❶ C (Basic dynamic load rating), Co (Basic static load rating)

❷ Mt (Torsional moment of dynamic load), Mto (Torsional moment of static load)

❸ ML(Longitudinal moment of dynamic load), MLo (Longitudinal moment of static load)



(Unit : mm)

Rail dimension									Basic load rating [kN]		Moment [kN•m]				Mass	
W1	W2	H1	F	Bolt hole			G	Max langth of rail L0	C	Co	Mt	Mto	M_L	M_{Lo}	Block [kg]	Rail [kg/m]
				d	D	h										
23	12.5	24.5	30	7	11	11.5	14	4000	28.7	57.6	0.43	0.86	0.28	0.57	0.6	3.4
23	12.5	24.5	30	7	11	11.5	14	4000	38.9	76.8	0.58	1.15	0.49	0.97	0.8	3.4
34	18	32	40	9	15	17	19	4000	53.3	99	1.17	2.19	0.67	1.25	1.6	6.5
34	18	32	40	9	15	17	19	4000	72.6	136	1.59	3.01	1.18	2.24	2	6.5
45	20.5	40	52.5	14	20	19	25	4000	95	184	2.61	5.07	1.53	2.97	3.1	10.7
45	20.5	40	52.5	14	20	19	25	4000	119.5	242.2	3.29	6.67	2.44	4.95	4.1	10.7
53	23.5	48	60	16	24	22	29	4000	132.6	256	4.50	8.70	2.57	4.98	4.7	15.2
53	23.5	48	60	16	24	22	29	4000	176	351	5.97	11.91	4.47	8.91	6.2	15.2
63	31.5	55	75	18	26	26	36.5	4000	212	414	8.10	15.78	5.21	10.14	8.5	22.5
63	31.5	55	75	18	26	26	36.5	4000	276	579	10.53	22.10	8.98	11.84	12.7	22.5

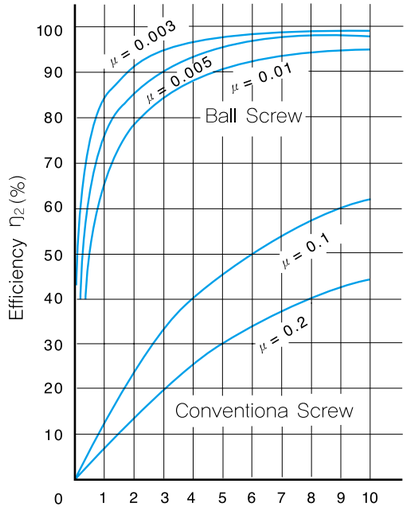
Ball Screw

Technical Data / SBC Precision Rolled Ball Screw /
DIN Standard SBC Precision Rolled Ball Screw /

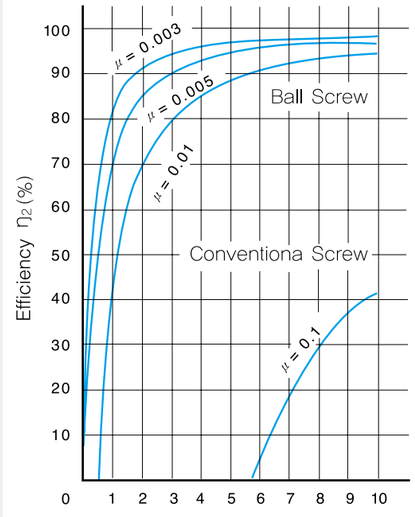
Ball Screw Features

A ball screw achieves high efficiency even if driving torque is low because balls roll between the screw shaft and ball nut to obtain a lower coefficient of friction than a leadscrew.

- Low Coefficient of Friction and High efficiency
- High Velocity and Acceleration.
- Long Service Life Time.



(Load Angle)



(Load Angle)

[Calculating the Lead Angle]

$$\tan\beta = \frac{L}{\pi \cdot dp}$$

β : Lead angle
L : Lead
dp : Ball circle diameter

Structures and Classification

The ball screw is composed of a screw, a nut and balls, Screws are classified by processing and Ball Nuts are classified by recirculation method.

1. Screw Shaft

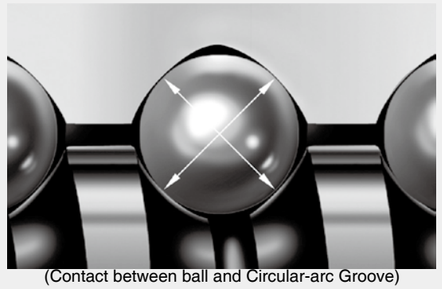
1-1. Types by Manufacturing Method

There are 2 types, Rolled and Ground Screw Threads.

A rolled screw is manufactured by roll forming a thread form into a rod. A Ground screw is manufactured by grinding the thread form into a rod. Generally ground screws are much more precise and smooth.

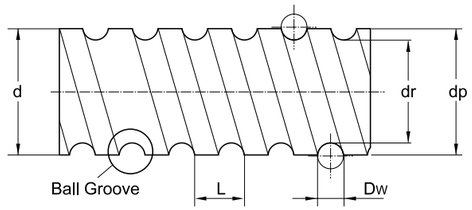
1-2. Circular-arc groove and ball contact structures

Four-point and Two-point Contact Structure



(Contact between ball and Circular-arc Groove)

1-3. Structure of the Screw Shaft



[Screw Diameter : d]

It means screw shaft outer diameter.

[Lead : L]

The amount of linear movement achieved by 1 revolution of screw movement.

[Ball Diameter : Dw]

Ball diameter.

[screw-shaft thread minor diameter : dr]

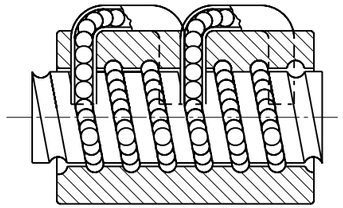
The diameter of the screw measured from the bottom of the thread form.

[Ball center-to-center diameter : dp]

The screw diameter measured from the center of balls rolling in the thread form. This number is necessary to calculate maximum permissible speed and lifetime.

2. Nuts

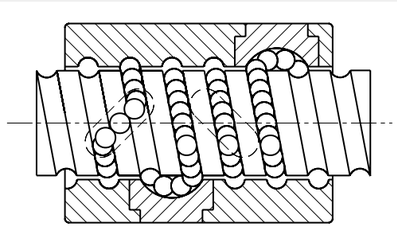
The nut is classified by Recirculation method.



[Return Tube Type]

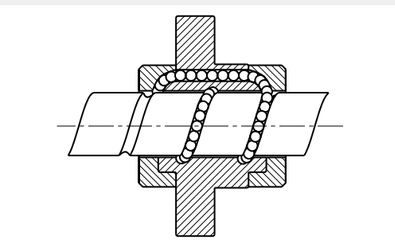
The most common type.

A return plate allows balls to recirculate.



[Deflector Type]

Compact type, Easy to install



[End-cap Type]

These nut are suitable for long-lead type.

Balls are recirculating in an end-cap.

[Inner-recirculation Type]

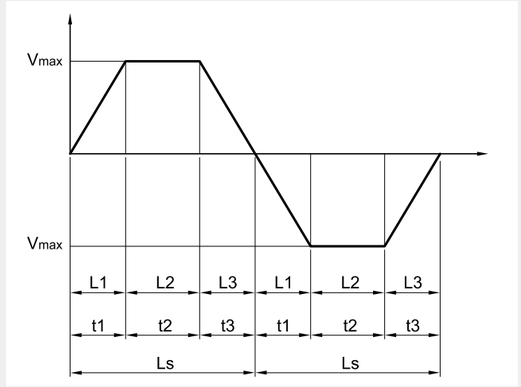
Similar to End-cap type.

There is a passage of balls circulating inside of the nut and return piece allows balls to circulate. It is suitable for high-speed.

Selecting a Ball screw

[Ball Screw Requirements]

- Orientation : Horizontal / Vertical
- Payload mass : m (kg)
- Linear Bearing Type : Rolling / Sliding
- Frictional coefficient of the Linear Bearing : μ
- Linear Bearing Resistance : f (N)
- External load in the axial direction : F (N)
- Support method of the screw shaft : fixed-free / fixed-supported / fixed-fixed
- Desired service life time : Lh (h)
- Stroke length : Ls (mm)
- Operating Speed : V_{max} (m/s)
- Acceleration time : t1 (sec)
- Constant velocity time : t2 (sec)
- Deceleration time : t3 (sec)
- Dwell time : td (sec)
- Acceleration : a (m/s^2)
- Acceleration distance : L1 (mm)
- Constant velocity distance : L2 (mm)
- Deceleration distance : L3 (mm)
- Number of revolutions per minute : n (min^{-1})
- Positioning accuracy : - (mm)
- Positioning repeatability : - (mm)
- Backlash : - (mm)



[Motor Requirements]

- Motor Type : AC servomotor / stepping motor, etc.
- The rated speed of the motor : - (min^{-1})
- Moment of Inertia of the motor : Jm ($kg.m^2$)
- Motor resolution : - (pulse / rev)
- Reduction ratio : A

※ References

1) Acceleration $$a = \frac{V_{max}}{t1}$$

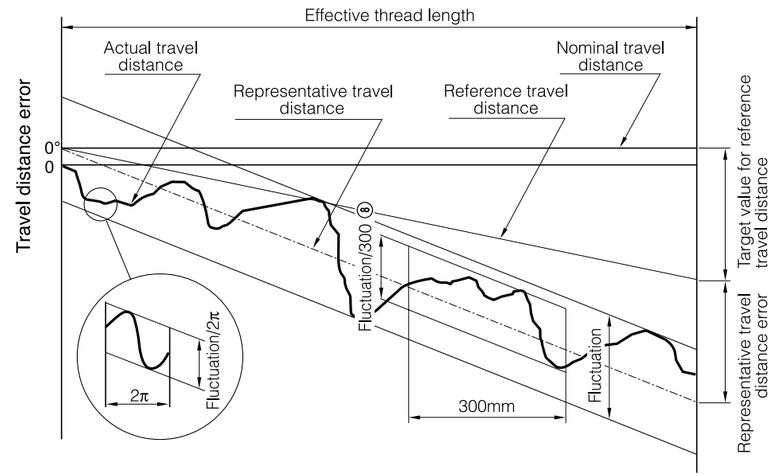
2) Acceleration distance $$L1 = \frac{V_{max} \times t1 \times 1000}{2}$$

3) Even speed distance $$L2 = V_{max} \times t2 \times 1000$$

4) Deceleration distance $$L3 = \frac{V_{max} \times t3 \times 1000}{2}$$

Lead Accuracy [JIS B1192 - 1997]

Accuracy grades C0 ~ C5 are described in the linearity and direction, and C7 ~ C10 in the travel distance error in relation to 300mm. By JIS (JIS B1192-1997)



[Effective thread length]

The Effective Thread Length is the length of thread over which Errors are measured.

[Nominal travel distance]

The Nominal Travel Distance is the ideal travel of screw without errors.

[Reference Travel Distance]

Intended correcting value of the nominal travel distance in relation to the measured use.

[Actual Travel distance]

The actual measured travel distance

[Representative Travel Distance]

A straight line approximating the actual travel that is calculated by using the least squares method of the actual travel distance curve.

[Representative Travel Distance Error]

Difference between the representative travel distance and the reference travel distance.

[Fluctuation]

The maximum error of the actual travel measured as the distance between two straight lines drawn in parallel with the representative travel distance.

[Fluctuation / 300]

Deviation of travel from representative over a given thread length (300mm)

[Fluctuation / 2π]

Deviation of travel from representative over one rotation of the screw shaft.

[Target Value for Reference Travel Distance]

Indicating a target value for the reference travel distance.

[Permissible Lead Accuracy Errors]

(Unit : ㎛)

Thread Length (mm)		Precision Grade													
		C0		C1		C2		C3		C5		C7		C10	
From	To	±E	e	±E	e	±E	e	±E	e	±E	e	±E	e	±E	e
–	100	3	3	3.5	5	5	7	8	8	18	18				
100	200	3.5	3	4.5	5	7	7	10	8	20	18				
200	315	4	3.5	6	5	8	7	12	8	23	18				
315	400	5	3.5	7	5	9	7	13	10	25	20				
400	500	6	4	8	5	10	7	15	10	27	20				
500	630	6	4	9	6	11	8	16	12	30	23				
630	800	7	5	10	7	13	9	18	13	35	25				
800	1000	8	6	11	8	15	10	21	15	40	27				
1000	1250	9	6	13	9	18	11	24	16	46	30				
1250	1600	11	7	15	10	21	13	29	18	54	35	±50/300		±210/300	
1600	2000	–	–	18	11	25	15	35	21	65	40				
2000	2500	–	–	22	13	30	18	41	24	77	46				
2500	3150	–	–	26	15	36	21	50	29	93	54				
3150	4000	–	–	30	18	44	25	60	35	115	65				
4000	5000	–	–	–	–	52	30	72	41	140	77				
5000	6300	–	–	–	–	65	36	90	50	170	93				
6300	8000	–	–	–	–	–	–	110	60	210	115				
8000	10000	–	–	–	–	–	–	–	–	260	140				

* ±E: Representative travel distance error * e: Fluctuation

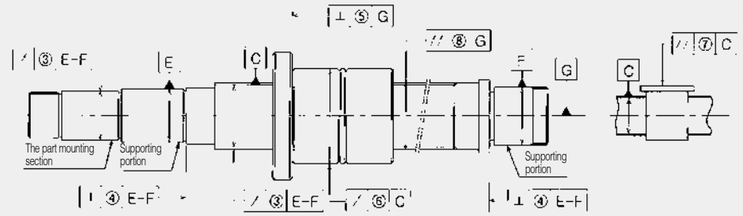
[Permissible Value of the Lead Accuracy]

(Unit : ㎛)

Fluctuation	C0	C1	C2	C3	C5	C7	C10
ν / 300	3.5	5	7	8	18	50	210
ν / 2π	2.5	4	5	6	8	–	–

Mounting Surface Accuracy

[Mounting Surface Accuracy C0]

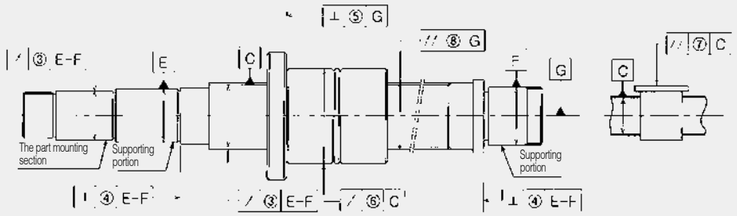


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
-	8	3	2	-	20	5	5	-	50	5
8	12	4	2	20	32	5	6	50	100	7
12	20	4	2	32	50	6	7	100	200	-
20	32	5	2	50	80	7	8			
32	50	6	2	80	125	7	9			
50	80	7	3	125	160	8	10			
80	125	-	-	160	200	-	-			
				200	250	-	-			

Screw shaft length / Screw shaft outer diameter		Above	-	8	12	20	32	50	80
		Less	8	12	20	32	50	80	125
Above	Less								
-	125		0.015	0.015	0.015				
125	200		0.025	0.020	0.020	0.015			
200	315		0.035	0.025	0.020	0.020			
315	400			0.035	0.025	0.020	0.015		
400	500			0.045	0.035	0.025	0.020		
500	630			0.050	0.040	0.030	0.020	0.015	
630	800				0.050	0.035	0.025	0.020	
800	1000				0.065	0.045	0.030	0.025	
1000	1250				0.085	0.055	0.040	0.030	
1250	1600				0.110	0.070	0.050	0.040	
1600	2000					0.095	0.065	0.045	
2000	2500								
2500	3150								
3150	4000								
4000	5000								
5000	6300								
6300	8000								
8000	10000								

[Mounting Surface Accuracy C1]

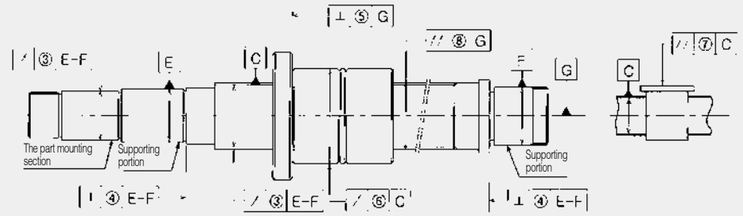


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	5	3	–	20	6	6	–	50	6
8	12	5	3	20	32	6	7	50	100	8
12	20	6	3	32	50	7	8	100	200	10
20	32	7	3	50	80	8	10			
32	50	8	3	80	125	9	12			
50	80	9	4	125	160	10	13			
80	125	10	4	160	200	11	16			
				200	250	12	18			

⑧ Screw shaft outer diameter / Screw shaft length		Above	–	8	12	20	32	50	80
		Less	8	12	20	32	50	80	125
Above	Less								
-	125		0.020	0.020	0.015				
125	200		0.030	0.025	0.020	0.015			
200	315		0.040	0.030	0.025	0.020			
315	400		0.045	0.040	0.030	0.025	0.020		
400	500			0.050	0.040	0.030	0.025		
500	630			0.060	0.045	0.035	0.025	0.020	
630	800				0.060	0.040	0.030	0.025	
800	1000				0.075	0.055	0.040	0.030	0.025
1000	1250				0.095	0.065	0.045	0.035	0.030
1250	1600				0.130	0.085	0.060	0.045	0.035
1600	2000					0.120	0.080	0.055	0.040
2000	2500						0.100	0.070	0.050
2500	3150						0.130	0.090	0.060
3150	4000							0.120	0.080
4000	5000								
5000	6300								
6300	8000								
8000	10000								

[Mounting Surface Accuracy C2]

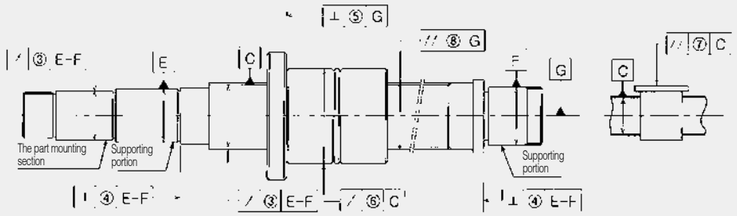


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	7	4	–	20	7	8	–	50	7
8	12	7	4	20	32	7	9	50	100	9
12	20	8	4	32	50	8	10	100	200	12
20	32	9	4	50	80	9	13			
32	50	10	4	80	125	11	16			
50	80	11	5	125	160	12	18			
80	125	13	5	160	200	13	21			
				200	250	14	23			

⑧ Screw shaft outer diameter / Screw shaft length		Above	–	8	12	20	32	50	80
		Less	8	12	20	32	50	80	125
Above	Less								
–	125		0.023	0.023	0.018				
125	200		0.033	0.030	0.023	0.018			
200	315		0.045	0.035	0.028	0.025			
315	400		0.053	0.045	0.035	0.030	0.023		
400	500			0.058	0.045	0.035	0.028		
500	630			0.065	0.050	0.040	0.030	0.025	
630	800				0.065	0.050	0.035	0.030	
800	1000				0.085	0.060	0.045	0.035	0.028
1000	1250				0.110	0.075	0.055	0.040	0.033
1250	1600				0.145	0.100	0.070	0.050	0.038
1600	2000					0.130	0.090	0.065	0.045
2000	2500						0.110	0.080	0.055
2500	3150						0.145	0.100	0.070
3150	4000						0.200	0.135	0.090
4000	5000							0.180	0.115
5000	6300								
6300	8000								
8000	10000								

[Mounting Surface Accuracy C3]

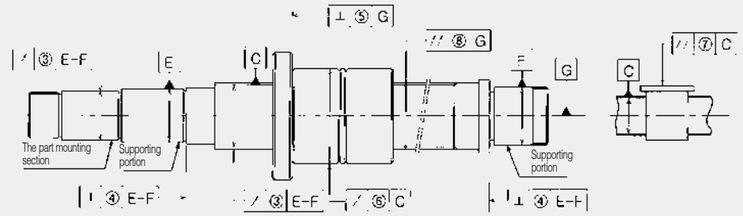


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	8	4	–	20	8	9	–	50	8
8	12	8	4	20	32	8	10	50	100	10
12	20	9	4	32	50	8	12	100	200	13
20	32	10	4	50	80	10	15			
32	50	12	4	80	125	12	20			
50	80	13	5	125	160	13	22			
80	125	15	6	160	200	14	25			
				200	250	15	28			

⑧ Screw shaft outer diameter / Screw shaft length		Above	–	8	12	20	32	50	80
		Less	8	12	20	32	50	80	125
Above	Less								
–	125		0.025	0.025	0.020				
125	200		0.035	0.035	0.025	0.020			
200	315		0.050	0.040	0.030	0.030			
315	400		0.060	0.050	0.040	0.035	0.025		
400	500			0.065	0.050	0.040	0.030		
500	630			0.070	0.055	0.045	0.035	0.030	
630	800				0.070	0.055	0.040	0.035	
800	1000				0.095	0.065	0.050	0.040	0.030
1000	1250				0.120	0.085	0.060	0.045	0.035
1250	1600				0.160	0.110	0.075	0.055	0.040
1600	2000					0.140	0.095	0.070	0.050
2000	2500						0.120	0.085	0.060
2500	3150						0.160	0.110	0.075
3150	4000						0.220	0.150	0.100
4000	5000							0.200	0.130
5000	6300								
6300	8000								
8000	10000								

[Mounting Surface Accuracy C5]

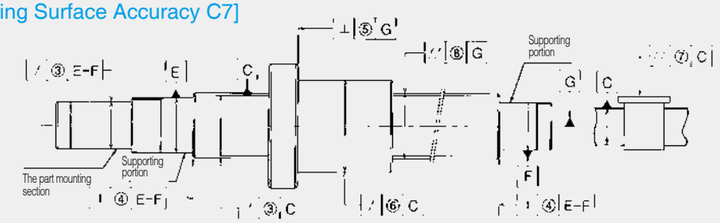


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	10	5	–	20	10	12	–	50	10
8	12	11	5	20	32	10	12	50	100	13
12	20	12	5	32	50	11	15	100	200	17
20	32	13	5	50	80	13	19			
32	50	15	5	80	125	15	27			
50	80	17	7	125	160	17	30			
80	125	20	8	160	200	18	34			
				200	250	20	38			

⑧ Screw shaft outer diameter / Screw shaft length		Above	–	8	12	20	32	50	80
		Less	8	12	20	32	50	80	125
Above	Less								
–	125		0.035	0.035	0.035				
125	200		0.050	0.040	0.040	0.035			
200	315		0.065	0.055	0.045	0.040			
315	400		0.075	0.065	0.055	0.045	0.035		
400	500			0.080	0.060	0.050	0.045		
500	630			0.090	0.075	0.060	0.050	0.040	
630	800				0.090	0.070	0.055	0.045	
800	1000				0.120	0.085	0.065	0.050	0.045
1000	1250				0.150	0.100	0.075	0.060	0.050
1250	1600				0.190	0.130	0.095	0.070	0.055
1600	2000					0.170	0.120	0.085	0.065
2000	2500						0.150	0.110	0.080
2500	3150						0.200	0.140	0.095
3150	4000						0.260	0.180	0.120
4000	5000							0.240	0.160
5000	6300							0.310	0.210
6300	8000								0.280
8000	10000								0.370

[Mounting Surface Accuracy C7]

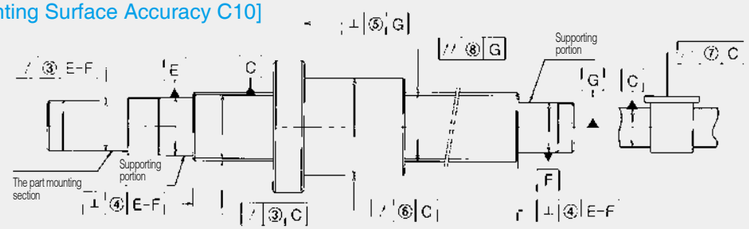


(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	14	7	–	18	14	20	–	50	17
8	12	14	7	8	30	14	20	50	100	17
12	20	14	7	30	50	18	30	100	200	30
20	32	20	7	50	80	18	30	200	400	30
32	50	20	8	80	120	20	40			
50	80	20	10	120	150	20	40			
80	125	30	11	150	180	25	50			
125	200	30	13	180	250	25	50			
				250	300	25	50			

⑧ Screw shaft length / Screw shaft outer diameter		Above	–	8	12	20	32	50	80	125
		Less	8	12	20	32	50	80	125	200
Above	Less									
–	125		0.060	0.055	0.055					
125	200		0.075	0.065	0.060	0.055				
200	315		0.100	0.080	0.070	0.060				
315	400			0.100	0.080	0.070	0.065			
400	500			0.120	0.095	0.080	0.070			
500	630			0.150	0.110	0.090	0.075	0.065		
630	800				0.140	0.100	0.085	0.070		
800	1000				0.170	0.130	0.100	0.080	0.070	
1000	1250				0.210	0.150	0.120	0.090	0.075	
1250	1600				0.270	0.190	0.140	0.110	0.085	0.070
1600	2000					0.250	0.180	0.130	0.100	0.080
2000	2500					0.320	0.220	0.160	0.120	0.090
2500	3150						0.280	0.200	0.140	0.110
3150	4000						0.380	0.260	0.180	0.130
4000	5000						0.510	0.340	0.230	0.160
5000	6300							0.440	0.300	0.200
6300	8000							0.600	0.400	0.270
8000	10000								0.530	0.350
10000	12500								0.700	0.460

[Mounting Surface Accuracy C10]



(Unit : ㎛)

Shaft outer diameter		③	④	Nut diameter		⑤	⑥	Reference length of mounting section		⑦
Above	Less			Above	Less			Above	Less	
–	8	40	10	–	18	20	40	–	50	30
8	12	40	10	8	30	20	40	50	100	30
12	20	40	10	30	50	30	60	100	200	50
20	32	60	10	50	80	30	60	200	400	50
32	50	60	12	80	120	40	80			
50	80	60	14	120	150	40	80			
80	125	80	16	150	180	50	100			
125	200	80	18	180	250	50	100			
				250	300	50	100			

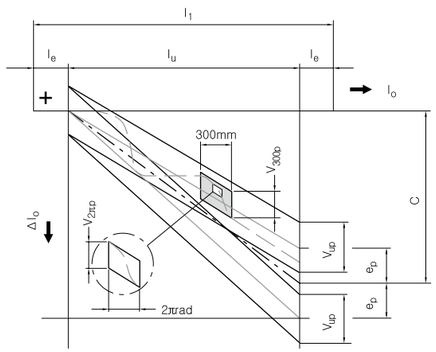
⑧ Screw shaft length / Screw shaft outer diameter		Above	–	8	12	20	32	50	80	125
		Less	8	12	20	32	50	80	125	200
Above	Less									
–	125		0.100	0.095	0.090					
125	200		0.140	0.120	0.110	0.095				
200	315		0.201	0.160	0.130	0.110				
315	400			0.210	0.060	0.130	0.110			
400	500			0.270	0.200	0.160	0.130			
500	630			0.350	0.250	0.190	0.150	0.120		
630	800			0.460	0.320	0.230	0.170	0.140		
800	1000				0.420	0.300	0.220	0.170	0.130	
1000	1250				0.550	0.380	0.270	0.200	0.150	
1250	1600				0.730	0.500	0.340	0.250	0.180	0.150
1600	2000				1.000	0.690	0.460	0.320	0.230	0.180
2000	2500					0.930	0.610	0.420	0.290	0.210
2500	3150					1.300	0.820	0.550	0.380	0.270
3150	4000						1.100	0.750	0.500	0.340
4000	5000						1.600	1.000	0.680	0.460
5000	6300							1.400	0.920	0.600
6300	8000							2.000	1.300	0.830
8000	10000								1.800	1.100
10000	12500								2.500	1.600

Lead Accuracy [DIN6905]

Lead accuracy according to DIN6905 standard is specified by tolerance classes which are P-Positioning Class Ball Screws and T-Transport Class Ball screws.

[P-Positioning Class Ball Screws]

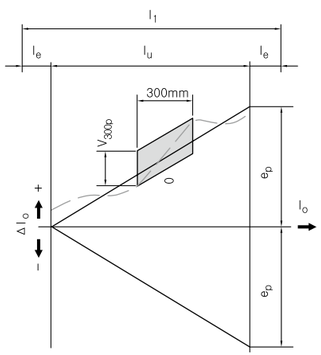
Maximum error over useful length = $e_p+1/2V_{up}+C$



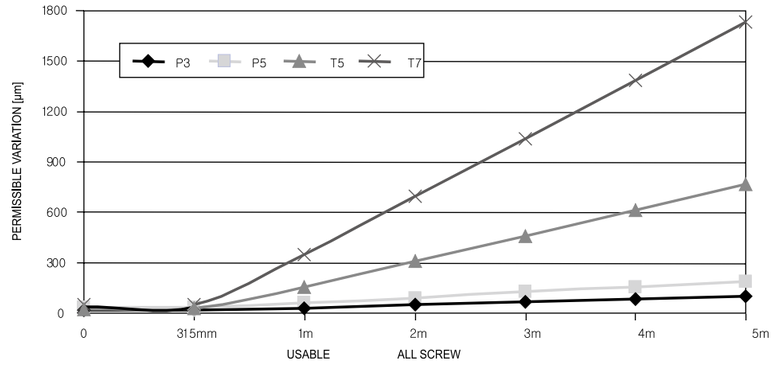
- l_o = Travel distance
- l_1 = Axial thread length
- Δl_o = The tolerance of travel distance
- l_u = Actual travel distance
- l_e = Exceed travel distance
- C = Compensation for actual travel distance (Standard: C=0)
- e_p = Tolerance on useful travel
- V_{up} = Permissible travel variation within useful travel l_u
- V_{300p} = Permissible travel variation within 300mm travel
- $V_{2\pi p}$ = Permissible travel variation within 2π travel

[T-Transport Class Ball Screws]

Maximum error over useful length = $e_p+1/2V_{up}+C$



[Cumulative lead variation over usable length]



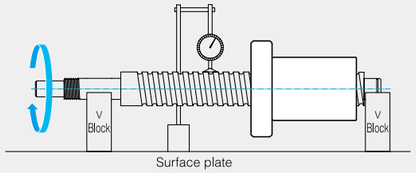
Tolerance Class	Lead Accuracy V_{300P}	Permissible cumulative travel variation over long distance															
		l_0	>	-	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
		(mm)	≤	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300
P3	±12㎛/300mm	e_p(㎛)		12	13	15	16	18	21	24	29	35	41	50	62	76	-
		V_{up}(㎛)		12	12	13	14	16	17	19	22	25	29	34	41	49	-
P5	±23㎛/300mm	e_p(㎛)		23	25	27	30	35	40	46	54	65	77	93	115	140	170
		V_{up}(㎛)		23	25	26	29	31	35	39	44	51	59	69	82	99	119
T5	±12㎛/300mm	V_{up}(㎛)		23	$=2xl_u/300xV_{300P}$												
T7	±52㎛/300mm	V_{up}(㎛)		52	$=2xl_u/300xV_{300P}$												

Measuring the Mounting Surface Accuracy

Support the supporting part of the screw shaft with V blocks. Set a measuring instrument on the circumference of the screw shaft, and find the largest difference on the dial gauge at several points when turning the screw shaft by one rotation.

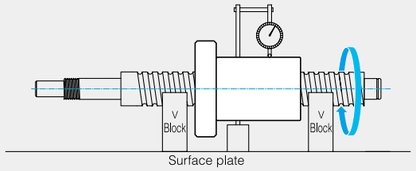
(1) Overall Radial Runout of the Screw Shaft Axis

Support the supporting part of the screw shaft with V blocks. Set a measuring instrument on the circumference of the screw shaft, and find the largest difference on the dial gauge at several points when turning the screw shaft by one rotation.



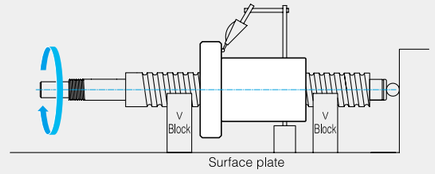
(2) Radial Runout of the Nut Circumference according to the screw shaft Axis

Support the thread of the screw shaft with V blocks near the nut. Set a measuring instrument on the circumstance of the nut, and find the largest difference on the dial gauge when turning only the nut by one rotation (without turning the screw shaft).



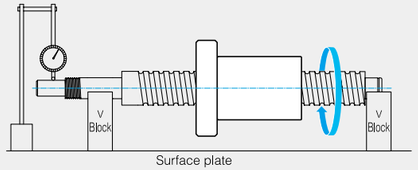
(3) Perpendicularity of the Flange Mounting Surface of the screw shaft to the screw shaft axis

Support the thread of the screw shaft with V blocks near the nut. Set a measuring instrument on the screw shaft's supporting portion end, and find the largest difference on the dial gauge when turning the screw shaft and the nut at the same time by one rotation at the same time.



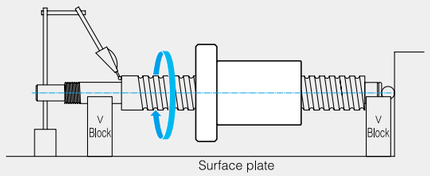
(4) Runout of the Part Mounting section according to the Screw shaft

Set a measuring instrument on the part mounting section, and find the largest difference on the dial gauge when turning the screw shaft by one rotation.



(5) Perpendicularity of the supporting portion End of the screw shaft to the supporting portion axis.

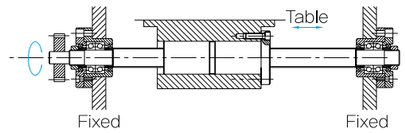
Set a measuring instrument on the screw shaft's supporting portion end, and read the largest difference on the dial gauge when turning the screw shaft by one rotation.



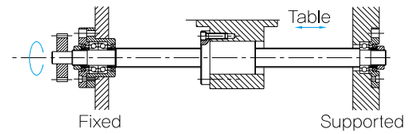
Mounting Method

There four mounting methods for the Ball Screw. Select appropriate mounting method.

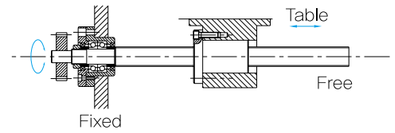
Permissible Axial load and numbers of rotation vary according to the mounting method.



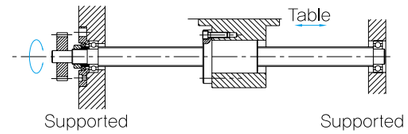
(Fixed - Fixed)



(Fixed - Supported)



(Fixed - Free)



(Supported - Supported)

[Mounting Method Based on Conditions]

Mounting	Conditions
Fixed - Fixed	High load and speed, Long distance
Fixed - Supported	Medium load and speed, Normal distance
Fixed - Free	Medium load, low speed, Short distance
Supported - Supported	Low load and speed, Short distance

Preload

In order to remove the axial clearance and minimize the displacement under an axial load.

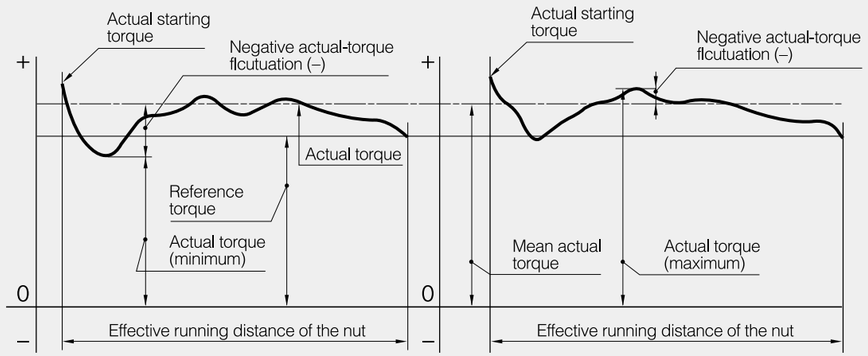
For a highly accurate positioning, a preload is generally provided.

[Clearance]

For the Axial clearance, refer to the specifications.

Preload Torque

The preload Torque follows the JIS Standard (B 1192-1997).



[Dynamic Preload Torque]

The torque necessary to rotate a screw shaft in a preloaded nut (without external load).

[Actual Torque]

Measured torque required to rotate a ball screw.

[Torque Fluctuation]

The variation of torque required to rotate a screw in a preloaded nut compared to the nominal torque.

[Reference Torque]

A dynamic preload torque set as a target.

[Calculating the Reference Torque]

Refer to an equation below.

$$Tp = 0.05(\tan\beta)^{-0.5}\ \frac{Fao \cdot L}{2\pi}$$

Tp : Reference torque (N·mm)
β : Lead angle
Fao : Applied preload (N)
L : Load (mm)

[Calculating the Torque Fluctuation]

Divide thread length by screw shaft outer diameter gives the torque fluctuation.

Tolerance range in torque fluctuation as the table below.

Reference torque N · mm		Effective thread length									
		4000m or less								Above 4,000m and 10,000m or less	
		$\frac{\text{Thread length}}{\text{Screw shaft outer diameter}} \leq 40$				$40 < \frac{\text{Thread length}}{\text{Screw shaft outer diameter}} < 60$				-	
		Accuracy grades				Accuracy grades				Accuracy grades	
Above	Less	C0	C1	C2, C3	C5	C0	C1	C2, C3	C5	C2, C3	C5
200	400	±35%	±40%	±45%	±55%	±45%	±45%	±55%	±65%	-	-
400	600	±25%	±30%	±35%	±45%	±38%	±38%	±45%	±50%	-	-
600	1000	±20%	±25%	±30%	±35%	±30%	±30%	±35%	±40%	±40%	±45%
1000	2500	±15%	±20%	±25%	±30%	±25%	±25%	±30%	±35%	±35%	±40%
2500	6300	±10%	±15%	±20%	±25%	±20%	±20%	±25%	±30%	±30%	±35%
6300	10000	-	-	±15%	±20%	-	-	±20%	±25%	±25%	±30%

[Example]

With a screw shaft length of 1500mm , shaft diameter of 31.6mm, ball circle diameter of 32mm, lead of 10mm, preload of 2000N, and Accuracy of C7, the preload torque is calculated as follows.

(1) Calculating the Reference Torque

$$\tan\beta = \frac{L}{\pi \cdot dp} = \frac{10}{\pi \cdot 32} = 0.0995$$

$$Tp = 0.05(\tan\beta)^{-0.5}\ \frac{Fao \cdot L}{2\pi}$$

$$= 0.05 \times (0.0995)^{-0.5}\ \frac{2000 \times 10}{2\pi}$$

$$= 504.8\ N \cdot mm$$

β : Lead angle
L : Lead (=10mm)
dp : Ball circle diameter (=32mm)
Fao : Preload (=2000N)
Tp : The reference torque

(2) Calculating the Torque Fluctuation

$$\frac{\text{Thread length}}{\text{Screw shaft outer diameter}} = \frac{1500}{31.6} = 47.4$$

The result is between 40 and 60, effective thread length, 4000mm or less and accuracy grade C5, the torque fluctuation is calculated as below.

$$504.8 \times (1 \pm 0.5) = 252.4 \sim 757.2\ N \cdot mm$$

Permissible Axial Load

[Buckling Load on the Screw Shaft]

It is important to choose a screw shaft so that it will not buckle when the maximum axial load is applied.

$$\text{Buckling load}\ (N) = \frac{\eta_1 \cdot \pi \cdot E \cdot I}{La^2} \times S$$

$$= \eta_2 \frac{dr^4}{La^2} 10^4$$

La : Distance between two mounting surfaces (mm)
E : Young's modulus (2.06 x 10^5 N/mm^2)
dr : Radius of curvature of the screw shaft (mm)
S : Safety factor (Normal 0.5)

* I : Minimum geometrical moment of inertia of the shaft (mm^4)

$$I = \frac{\pi}{64} dr^4$$

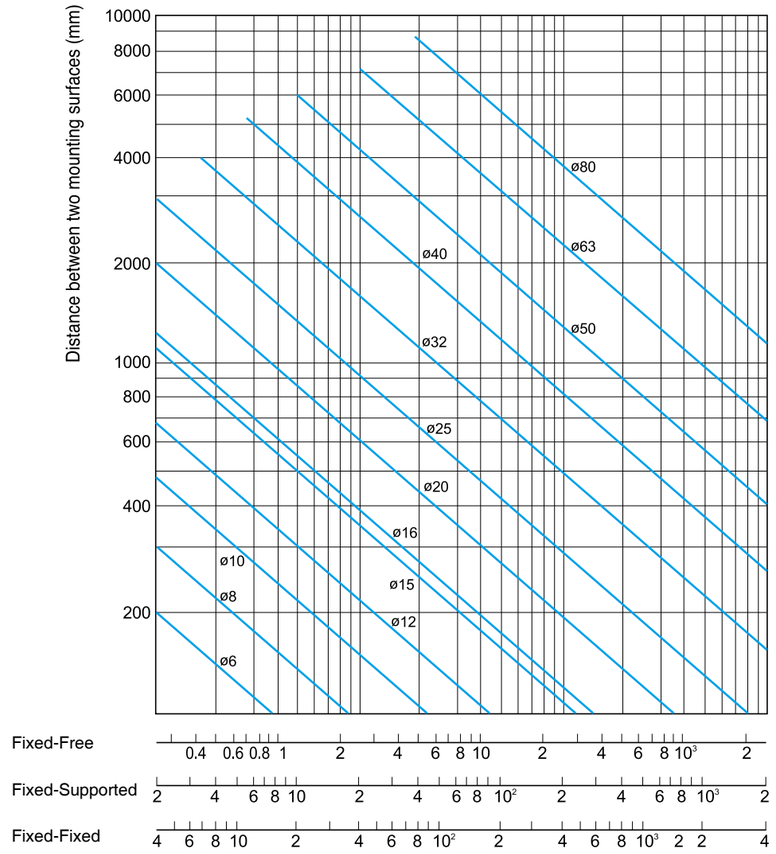
Fixed - Free	: $\eta_1 = 0.25$	$\eta_2 = 1.3$
Fixed - Supported	: $\eta_1 = 2$	$\eta_2 = 10$
Fixed - Fixed	: $\eta_1 = 4$	$\eta_2 = 20$

[Permissible Tensile Compressive Load on the Screw shaft]

It is necessary to consider not only the buckling load but also the permissible tensile compressive load according to the yielding stress on the screw shaft.

$$\text{Permissible tensile compressive load}\ (N) = \sigma \frac{\pi}{4} dr^4 = 116 dr^2$$

σ : Permissible tensile compressive stress (147Mpa)
dr : Screw-shaft thread minor diameter (mm)



(Permissible tensile compressive load diagram)

Permissible Rotational Speed

[Critical Speed of the screw Shaft]

When the rotational speed increases, the ball screw might be unable to operate due to the screw shaft's natural frequency. It is important to use below the dangerous speed (resonance point)

$$\text{Dangerous speed}(\text{min}^{-1}) = \frac{60 \cdot \lambda_1^2}{2\pi \cdot La^2} \times \sqrt{\frac{E \times 10^3 \cdot I}{\gamma \cdot A}} \times S$$

$$= \lambda_2 \frac{dr^4}{La^2} \cdot 10^7$$

La	:	Distance between two mounting surfaces (mm)
E	:	Young's modulus (2.06 x 10^5 N/mm²)
dr	:	screw-shaft thread minor diameter (mm)
S	:	Safety factor (Normal 0.8)
γ	:	Density (Specific gravity) (7.85 x 10^{-6} kg/mm³)

* I : Minimum geometrical moment of inertia of the shaft (mm⁴)

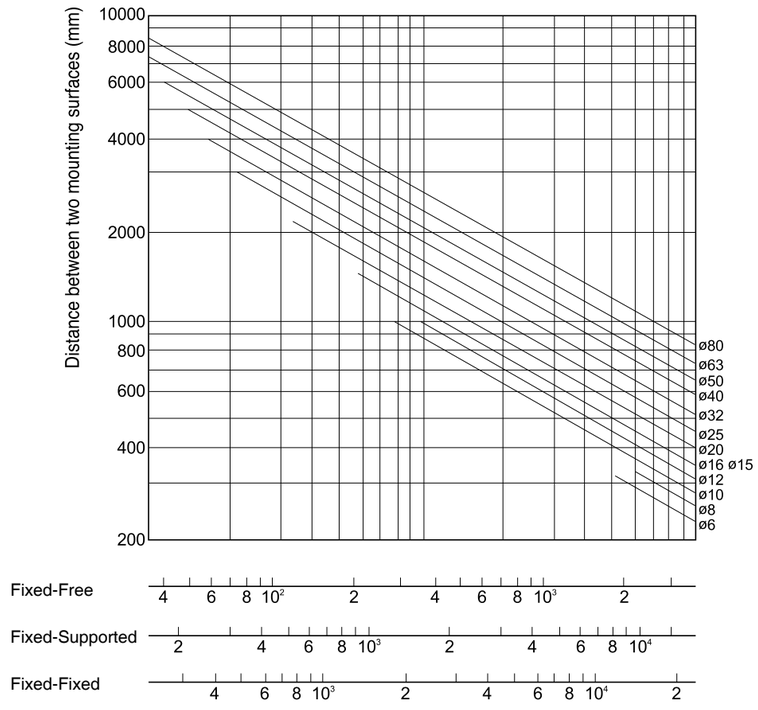
$$I = \frac{\pi}{64} dr^4$$

* A : Screw shaft cross-sectional area (mm²)

$$A = \frac{\pi}{4} dr^2$$

* λ_1, λ_2 : Factor according to the mounting method

Fixed - Free	:	λ_1 = 1.875	λ_2 = 3.4
Supported - Supported	:	λ_1 = 3.142	λ_2 = 9.7
Fixed - Supported	:	λ_1 = 3.927	λ_2 = 15.1
Fixed - Fixed	:	λ_1 = 4.73	λ_2 = 21.9



(Permissible tensile compressive load diagram)

DN Value

The DN Value is the ball circle diameter multiplied by the rpm (revolutions per minute) (min^{-1})

$$DN = D \times N$$

$$N(min^{-1}) = \frac{DN}{D}$$

N : Permissible rotational speed determined by the DN value (mm^{-1})

DN : DN coefficient
- : Precision Rolled ball screw : 90,000
- : Large Lead Rolled Ball Screw : 100,000
- : Ground Ball Screw : 70,000

D : Ball center-to-center diameter (mm)

Select the lesser value between critical speed and DN value for the maximum rotational speed.
Set “The maximum working Rotational speed < The Permissible Rotational speed ”
Please consider the following precautions.

(1) Exceeding the Critical Speed

- Exceeding the critical speed will cause the screw to shake and will generate excessive noise.
- The noise will increase when the nut is at either end of the screw shaft.
- The noise will decrease when the nut is in the middle of the screw shaft.

(2) Exceeding the DN Value

- Exceeding the DN Value speed will cause noise and vibration in the nut.
- Exceeding the DN Value speed can damage the recirculation parts of the nut (Deflector, Return tube, End-cap, Return plate).

Basic load rating & lifetime

[Load rating & life]

Under normal conditions, the ball screw can be damaged by metal fatigue as the result of repeated stress. The repeated stress causes flaking of the raceways and steel balls. The life of ball screw is defined as the total number of rotations that the ball screw rotates until flaking occurs.

(1) Nominal life (total number of rotations): L

We define the nominal life as the total number of rotations (L=total number of rotations) without flaking by 90% of a group of an identical group of ball screws operating under the same condition.

$$L = \left(\frac{C_a}{F_a} \right)^3 \times 10^6$$

L : Nominal life (total number of rotations)
Fa : Applied axial load
Ca : Basic dynamic load rating

(2) Basic dynamic load rating : Ca (kN)

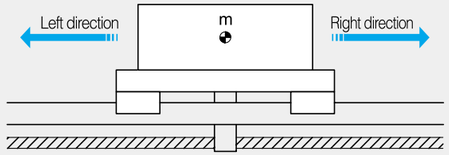
Basic dynamic load rating Ca is defined as load which is constant direction and volume, when operating one group of ball screw independently as L=106 under same condition.

(3) Basic static load rating : Coa (kN)

If an excessive load or shock is applied to the ball screw system in the static or dynamic state, permanent but local deformation can occur to the steel balls and raceway.

Calculating the axial load

[Horizontal installation]



- m : Mass (kg)
- g : Acceleration of gravity (m/s^2)
- a : Acceleration and deceleration (m/s^2)
- μ : Frictional coefficient of the guide surface
- f : Guide surface resistance (N)

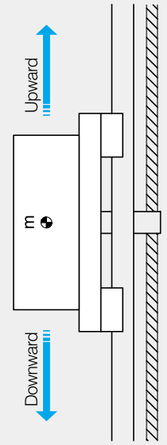
Axial load for left direction

Fa1(Acceleration : N) = μ · mg + f + ma
Fa2(Uniform motion : N) = μ · mg + f
Fa3(Deceleration : N) = μ · mg + f - ma

Axial load for right direction

Fa4(Acceleration : N) = μ · mg - f - ma
Fa5(Uniform motion : N) = μ · mg - f
Fa6(Deceleration : N) = μ · mg - f + ma

[Vertical installation]



Axial load for upward

Fa1(Acceleration : N) = mg + f + ma
Fa2(Uniform motion : N) = mg + f
Fa3(Deceleration : N) = mg + f - ma

Axial load for downward

Fa4(Acceleration : N) = mg - f - ma
Fa5(Uniform motion : N) = mg - f
Fa6(Deceleration : N) = mg - f + ma

- m : Mass (kg)
- g : Acceleration of gravity (m/s^2)
- a : Acceleration and deceleration (m/s^2)
- f : Guide surface resistance (N)

Static safety factor

There are two ways to select a ball screw. One depends on the value of static load and the other is based on the required life. Usually, the later is preferred.

$$F_{a\ max.} = \frac{C_{oa}}{f_s}$$

- $F_{a\ max.}$: Max permissible axial load (kN)
- C_{oa} : Basic static load rating (kN)
- f_s : Safety factor

Applied machine	Load conditions	Lower limit of f_s
General industrial machinery	Without vibration or impact	1.0 ~ 1.3
	With vibration or impact	2.0 ~ 3.0
Machine tool	Without vibration or impact	1.0 ~ 1.5
	With vibration or impact	2.5 ~ 7.0

Checking life time

[Calculating the nominal life]

$$L = \left(\frac{C_a}{f_w \cdot F_a} \right)^3 X\ 10^6$$

- L : Nominal life (Total number of rotations) (rev)
- Fa : Applied axial load (N)
- Ca : Basic dynamic load rating (N)
- fw : Load factors

Vibrations / Impact	Speed (V)	Load factor fw
Faint	Very low V ≦ 0.25 m/s	1 ~ 1.2
Weak	Slow 0.25 < V ≦ 1.0 m/s	1.2 ~ 1.5
Medium	Medium 1.0 < V ≦ 2.0 m/s	1.5 ~ 2.0
Strong	High V > 2.0 m/s	2.0 ~ 3.5

[Calculating life time]

Life time (Total number of rotations) calculation is as below.

$$Lh = \frac{L}{60 \cdot N} = \frac{L \cdot Ph}{2 \cdot 60 \cdot n \cdot S}$$

- L_h : Life time (h)
- L : Nominal life (Total number of rotations) (rev)
- N : Rotations per minute (min^{-1})
- n : Number of reciprocations per minute (min^{-1})
- P_h : Ball screw lead (mm)
- S : Stroke (mm)

[Calculating travel distance]

Calculating the travel distance is as below.

$$L_s = \frac{L \cdot Ph}{10^6}$$

Ls : Travel distance (km)
L : Nominal life (Total number of rotations) (rev)
Ph : Ball screw lead (mm)

[Calculating mean axial load]

The mean axial load is a constant load that is equivalent to nominal life in varying the load conditions.
If the load changes in stages, the mean axial load is as below.

$$Fm = \sqrt{\frac{(F_{a1}^6 L_1 + F_{a2}^3 L_2 + ... + F_{an}^3 L_n)}{L}}$$

- F_m : Mean axial load (N)
- F_{an} : Varying load (N)
- L : Total travel distance
- L_n : Distance travel under load in stages

Checking the rotational torque

The rotational torque can be calculated by below equation.

[During uniform]

Tt = T1 + T2 +T4

- Tt : Rotational torque for uniform motion (N·mm)
- T1 : Frictional torque by external load (N·mm)
- T2 : Preload torque by ball screw (N·mm)
- T4 : Other torque (N·mm)
  (Frictional torque by support unit or oil seal)

[During acceleration]

Tk = Tt + T3

- Tk : Rotational torque for acceleration (N·mm)
- Tt : Torque for uniform (N·mm)
- T3 : Torque for acceleration (N·mm)

[During deceleration]

Tg = Tt - T3

- Tg : Rotational torque for deceleration (N·mm)
- Tt : Torque for uniform (N·mm)
- T3 : Torque for deceleration (N·mm)

❶ Frictional torque by external load

In case turning force for ball screw, Frictional torque by external load can be calculated as below.

$$T1 = \frac{Fa \cdot Ph}{2\pi \cdot \eta} \times A$$

T1 : Frictional torque by external load (N·mm)
Fa : Axial load (N)
Ph : Ball screw lead (mm)
η : Ball screw efficiency (Normal: 0.9~0.95)
A : Reduction ratio

❷ Frictional torque by ball screw preload

$$T2 = Td \times A$$

- T2 : Preload torque of ball screw (N·mm)
- Td : Preload torque of ball screw (※ See the preload page)
- A : Reduction ratio

❸ Torque for acceleration

$$T3 = J \times \omega \times 10^3$$

- T3 : Torque for acceleration (N·mm)
- J : Inertia moment (kg·m²)
- ω : Angular acceleration (rad/s²)

* Equation of inertia moment (J)

$$J = m\left(\frac{Ph}{2\pi}\right)^2 \times A^2 \times 10^{-6} + J_S \cdot A^2 + J_A \cdot A^2 + J_B$$

- m : Mass (kg)
- Ph : Ball screw lead (mm)
- A : Reduction ratio
- JS : Inertia moment of the screw shaft (kg·m²)
- JA : Inertia moment of gear etc. which attached to screw shaft (kg·m²)
- JB : Inertia moment of gear etc. which attached to motor (kg·m²)

* Equation of angular acceleration (ω)

$$\omega = \frac{2\pi \cdot N}{60t}$$

- N : Motor rotations per minute (mm⁻¹)
- t : Acceleration time (sec)

* Inertial moment of a round object

$$J = \frac{m \cdot D^2}{8 \times 10^6}$$

- J : Inertial moment (kg·m²)
- m : Mass of a round object (kg)
- D : Screw shaft outer diameter (mm)

Selecting motor

[In case of using servomotor]

❶ Calculating rotational speed for motor

The required rotational speed for motor is as below.

$$N = \frac{V \times 1000 \times 60}{Ph} \times \frac{1}{A}$$

- N : Required rotational speed of the motor (min⁻¹)
- V : Feeding speed (m/s)
- Ph : Ball screw lead (mm)
- A : Reduction ratio

* The value for required rotational speed of the motor must be equal or below to the rated rotational speed of the motor

❷ Calculating resolution for motor

Calculating resolution for encoder and driver are as below.

$$R = \frac{Ph \cdot A}{S_{min}}$$

- R : Required resolution (p/rev)
- Ph : Ball screw lead (mm)
- A : Reduction ratio
- Smin : Minimum feed amount (mm)

❸ Calculating motor torque

The required torque for motor is various in accordance with acceleration, uniform and deceleration motion. See the page of rotational torque.

* Maximum torque

The required maximum torque for motor must be equal or lower to the pear torque of motor.

* Effective torque

Calculating effective torque is as below. The calculated value of effective torque must be equal or lower to rated torque of motor.

$$T_{rms} = \sqrt{\frac{(T1^2 \cdot t1 + T2^2 \cdot t2 + T3^2 \cdot t3)}{t}}$$

- Trms : Effective torque (N·mm)
- Tn : Fluctuating torque (N·mm)
- tn : Time for applying torque "Tn" (s)
- t : Cycle time (t1+t2+t3) (s)

* The value of effective torque must be equal or below to the rated torque of the motor

❹ Inertia Moment

The inertial moment required for the motor is as below

$$J_m = \frac{J}{C}$$

- Jm : Inertial moment required for the motor (kg·m²)
- C : Factor determined by the motor and the driver

* The inertial moment of the motor must be above to the inertial moment required for the motor.

[In case of using a stepping motor]

❶ Calculating minimum step angle

Calculating step angle for motor and driver is as below.

$$\theta = \frac{360 \cdot S_{min}}{Ph \cdot A}$$

- θ : Required step angle for motor (°)
- S_{min} : Minimum feed amount/ per step (mm)
- Ph : Ball screw lead (mm)
- A : Reduction ratio

❷ Calculating pulse speed

Calculating pulse speed is as below.

$$f = \frac{V \times 1000}{S_{min}}$$

- f : Pulse speed (Hz)
- V : Feeding speed (m/s)
- S_{min} : Minimum feed amount (mm)

❸ Calculating motor torque

The required torque for motor is various in accordance with acceleration, uniform and deceleration motion. See the page of rotational torque.

[Cautions for selecting motor]

When calculating required torque and pulse speed for selecting motor, the applied capacity of motor should be doubled for safety.

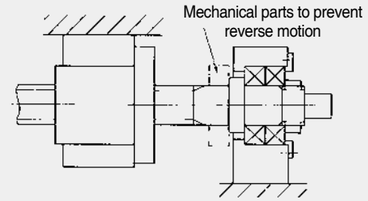
Precautions when mounting ball screw

[Nut bracket design]

In case of deflector, return tube types have projected part on nut itself, therefore the nut bracket should be designed in accordance with nut type.

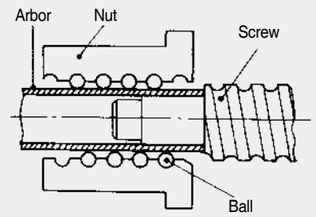
[End machining and designing nut environment]

When install the ball screw into machine, please avoid disassembling nut and screw type. Also, please install the components which prevent over-stroke of nut.



[When disassembling the nut from screw]

Please use temporary screw to put the nut during maintenance.



※ Cautions for disassembling the nut from screw

If there is mishandling while disassembling the nut from screw, it can cause the problem of nut position, preload, steel ball off and ball circulation part. Therefore, please contact SBC when you disassemble the nut from screw.

Safety Design

[Lubrication]

Lubrication for ball screw is a key part of its performance.

(1) Lubricants interval

The lubrication interval varies according to working conditions of the machine. Therefore, the following lubrication intervals are recommended. Also, mixed oil or grease feeding is not recommended.

Item	Checking time	Lubricant interval	Working condition and outcome	Volume of feeding
Grease	3 ~ 6 months	6 months~1 year	Normal condition	One third in nut space
Oil	1 week	According to checking	According to contamination and volume	Recommended volume according to screw diameter (see below)
	Everyday	Any time	According to volume of oil before use	

※ Recommended volume according to screw diameter

Screw diameter (mm)	Volume (cc)
4 ~ 15	0.05 / 3 min.
16 ~ 25	0.1 / 3 min.
32 ~ 40	0.2 / 3 min.
50 ~ 63	0.4 / 3 min.
80 ~ 100	0.5 / 3 min.

(2) Class of oil

Lubricant	Class
Oil	Turbine oil ISOVG32 ~ 68

(3) Classification and selection of lubrication

Lubricants for linear rail system must be selected after considering vibration, clean room, vacuum and working condition.

SBC supplies the two kinds of grease.

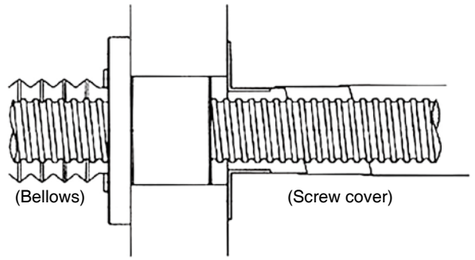
Item	Application	Brand [Company]
Normal working condition	Multipurpose industrial application	Shell Gadus S2 V100 3 [Korea shell]
Special working condition	Clean room	SNG 5050 [NTG Korea]
	Vibration	
	Wide temperature	

∗ Contact SBC if MSDS is required or a special purpose of grease is required.

- When planning to use a special lubricant, contact SBC before using it.
- When you use our produck in environment beyond the scope of use.

Safety design for dust proof

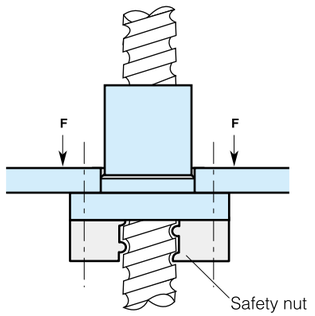
Ball screws have recirculating steel balls inside. Debris and other foreign objects such as cutting chips can damage the nut. Typically a seal is a standard part of the nut but if it is not available, please consider another method of protecting the nut for debris such as bellows.



[Safety nut]

If the ball screw is vertically installed, a safety nut should be applied. This nut blocks the load in case the ball nut has been destroyed by excessive force.

(Installation of a safety nut)



Anti-rust

2 types of surface treatment are available to prevent rust.

[AR-H : Raydent]

For corrosion resistance, raydent surface treatment is available. This treatment is suitable for corrosion resistance.

[AR-2F : Fluorocarbon raydent treatment]

Fluorocarbon coating on raydent-treatment is suitable where high corrosion resistance is required (water or salty water working condition).

※ Caution for surface treatment

❶ Use a higher safety factor for load life calculations when a surface treated ball screw system is selected.

❷ Except for the above surface treatments, other plating types usually cause performance problems.

❸ Contact SBC for surface treatments.

❹ Surface coating is not possible on some MBS nuts.
(Please check the page by model number)

SBC Precision Rolled Ball Screw

Type

SBC Precision Rolled Ball Screws are available in a variety of shaft diameters from Ø6mm to Ømm and a variety of Leads from 1mm to 40mm. Screws are available in P5 or T7 or both precision grades and lengths up to 7000mm depending on the particular screw.

STK Precision Rolled Ball Screw

SLK Long Lead Rolled Ball Screw

MBS Miniature Rolled Ball Screw

SBC Precision Rolled Ball Screw

Ball Screw shaft Model No.

(Unit : mm)

Model No.	Diameter	Lead	Max. Length	Accuracy
RM0601T	06	01	900	T7
RM0801T	08	01	1200	T7
RM0802T	08	02	1200	T7
RM0802.5T	08	02.5	1200	T7
RM1204T	12	04	1400	T7
RM1205T	12	05	1400	T7
RM1210T	12	10	1400	T7
RM1520T	15	20	3000	T7
RM1605	15.6	05	3000	P5, T7
RM1610	15.9	10	3000	T7
RM1616	15.9	16	3000	T7
RM2005	19.6	05	4000	P5, T7
RM2010T	20	10	3000	T7
RM2020	19.6	20	4000	P5, T7
RM2505	24.6	05	6000	P5, T7
RM2510	24.6	10	6000	P5, T7
RM2525	24.6	25	6000	P5, T7
RM3205	31.6	05	6000	P5, T7
RM3210	31.6	10	6000	P5, T7
RM3220	32	20	6000	T7
RM3232	32	32	6000	T7
RM4005	39.6	05	6000	P5, T7
RM4010	39.6	10	6000	P5, T7
RM4020	39.6	20	6000	P5, T7
RM4040	39.6	40	6000	P5, T7
RM5010	49.5	10	6000	P5, T7
RM5020	49.5	20	6000	P5, T7
RM5050T	50	50	6000	T7
RM6310	62.5	10	6000	P5, T7
RM8010	79.5	10	7000	T7

※ SBC follows DIN and JIS Standards.

DIN Standard	JIS Standard
P5	C5
T7	C7

SBC Precision Rolled Ball Screw

Ordering Example

[Nut Only Part Numbers]

32 20 SLK – S – KR
[1] [2] [3] [4] [5]

[1] Diameter
[2] Lead
[3] Nut Type : STK, SLK
[4] Preload : S (Clearance Type)
[5] Surface treatment : No symbol (standard), KR (Nut surface trearment)

※ MBS type must be ordered as a screw and nut assembly.
※ When ordering only a nut, the preload is only S type (Clearance type).

[Screw Shaft Only Part Numbers]

RM 3220T – 1500L – T7 – RR
[1] [2] [3] [4]

[1] Model No.
[2] Screw shaft length
[3] Accuracy
[4] Surface treatment : No symbol (standard), RR (Screw surface trearment)

※ Refer to the specifications for the Model No.
※ Individual screw shafts are only available in the T7 precision grade.
※ MBS type must be ordered as a screw and nut assembly.

SBC Precision Rolled Ball Screw

[Nut and Screw Assembly Part Numbers]

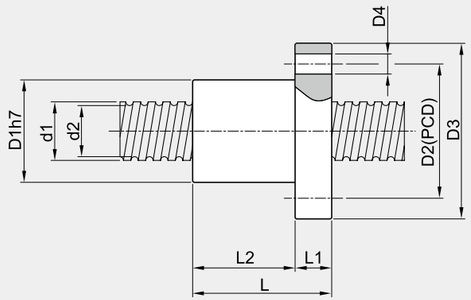
3220 SLK – A – 1 – 1300 / 1500 – T7 – AR
[1] [2] [3] [4] [5] [6] [7]

[1] Model No. : STK, SLK, MBS
[2] Preload : S (Clearance Type), A (Non-backlash Type)
[3] Nut Quantity : Nut Quantity on Screw shaft
[4] Thread Length : No Symbol (No processing)
[5] Total Length
[6] Accuracy : P5, T7
[7] Surface treatment : No symbol (standard), AR(Nut and Screw), KR (Nut only) RR (Screw only)

※ A screw-nut assembly is recommended if high accuracy or rigidity is required.
※ For surface treatment, mark the type of surface treatment.
※ If end machining is required, please attach a drawing.
※ Refer to the specifications for the Accuracy.
※ MBS type can only be ordered as a screw-nut assembly.
※ Surface coating is not possible on some MBS nuts.
(Please check the page by model number)

SBC Precision Rolled Ball Screw

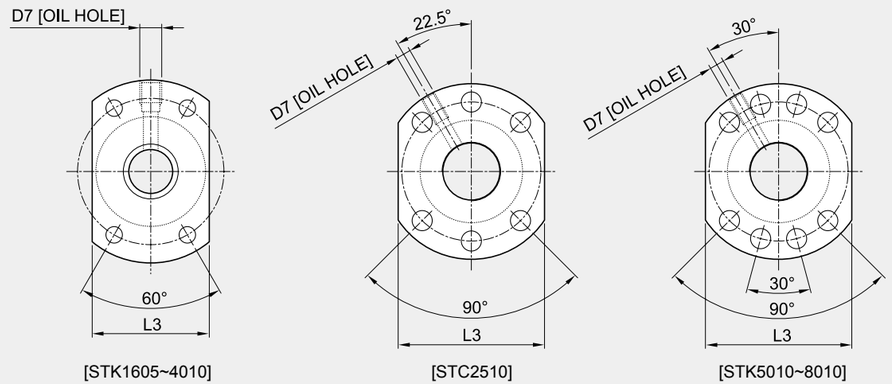
STK/STC Precision Rolled Ball Screw STK/STC Type



Model No.	d1 (Nominal diameter)	Ph (Lead)	do (Ball circle diameter)	Da (Ball Diameter)	d2 (Root - diameter)	i (No. of circuits)	D1	D2 (PCD)	D3
STK1605	15.6	5	16	3.5	12.7	3x1	34	44	54
STK2005	19.6	5	20	3.5	16.7	4x1	40	50	60
STK2505	24.6	5	25	3.5	21.7	4x1	43	55	67
STK2510	24.6	10	25	3.5	21.7	4x1	60	78	96
STC2510	24.6	10	25	3.5	21.7	4x1	40	51	62
STK3205	31.6	5	32	3.5	28.7	4x1	56	71	86
STK3210	31.6	10	32	5.556	27.1	4x1	67	85	103
STK4005	39.6	5	40	3.5	36.7	4x1	64	82	100
STK4010	39.6	10	40	7.144	36.7	4x1	76	96	116
STK5010	49.5	10	50	7.144	43	4x1	75	93	110
STK6310	62.5	10	63	7.144	56.9	6x1	90	108	125
STK8010	79.5	10	80	7.144	73.9	6x1	105	125	145

❶ Ca (Basic Dynamic load rating), Coa (Basic static load rating)

SBC Precision Rolled Ball Screw

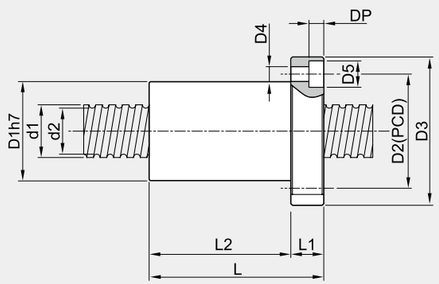


(Unit : mm)

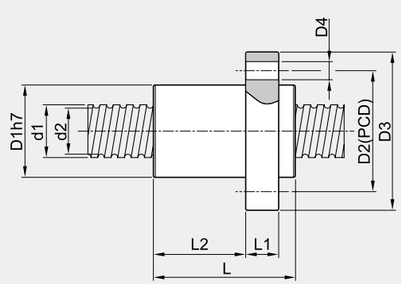
D4	D7	L	L1	L2	L3	Ca [kN]	Coa [kN]	Max. Length
4.5	M6x1	45	10	35	40	7.5	12.1	3000
4.5	M6x1	53	10	43	46	11.0	23.3	4000
5.5	M6x1	53	10	43	50	12.5	30.4	6000
9	M6x1	85	15	70	72	19.0	38.0	6000
6.6	M6x1	85	12	73	48	19.0	38.0	6000
6.6	M6x1	53	12	41	68	14.2	40.0	6000
9	M6x1	90	15	75	78	33.2	70.0	6000
9	M8x1	56	15	41	75	26.3	59.2	6000
11	M8x1	93	17	76	88	64.9	109	6000
11	M8x1	98	16	75	85	66.4	134.3	6000
11	M8x1	126	18	96	95	93.8	229.7	6000
13.5	M8x1	128	20	96	110	121.9	374.9	7000

SBC Precision Rolled Ball Screw

SLK Long Lead Rolled Ball Screw



[SLK1520, 2010]

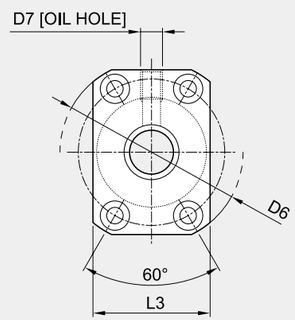


[SLK1610~5050]

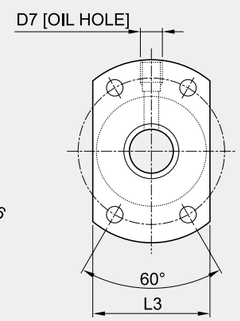
Model No.	d1 (Nominal diameter)	Ph (Lead)	do (Ball circle diameter)	Da (Ball Diameter)	d2 (Root - diameter)	i (No. of circuits)	D1	D2 (PCD)	D3	D4
SLK 1520	15	20	15.5	3.175	12.4	1.5x1	34	45	50	6
SLK 1610	15.9	10	16.6	3.175	13.4	3x1	34	45	57	5.5
SLK 1616	15.9	16	16.6	3.175	13.4	1.8x2	32	42	53	4.5
SLK 2010	20	10	21	3.969	17	2x1	46	59	74	6.6
SLK 2020	19.6	20	20	3.5	16.7	1.8x2	39	50	62	5.5
SLK 2525	24.6	25	25	3.5	21.7	1.8x2	47	60	74	6.6
SLK 3220	32	20	32.7	3.969	28.7	3x1	50	65	80	9
SLK 3232	32	32	33	4.762	28.2	1.8x2	58	74	92	9
SLK 4020	39.6	20	40	5.556	35.2	3x1	63	78	93	9
SLK 4040	39.6	40	40	7.144	34	1.8x2	73	93	114	11
SLK 5020	49.5	20	50	6.35	44.6	5x1	75	93	110	11

❶ Ca (Basic Dynamic load rating), Coa (Basic static load rating)

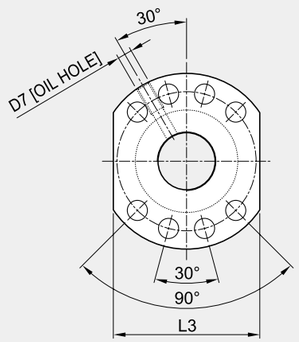
SBC Precision Rolled Ball Screw



[SLK1520]



[SLK1610~3232, 4040, 5050]



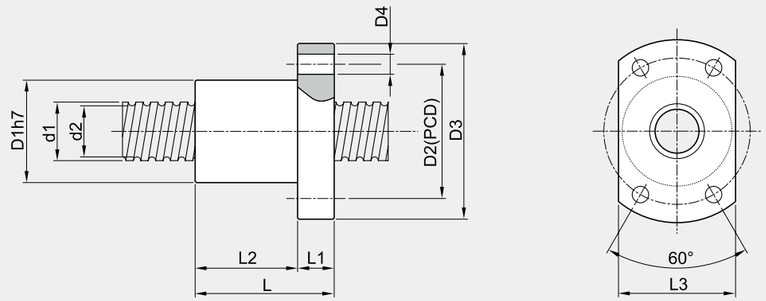
[SLK4020, 5020]

(Unit : mm)

D5	DP	D6	D7	L	L1	L2	L3	Ca [kN]	Coa [kN]	Max. Length
–	–	55	M4x0.7	57	7	50	34	4.56	7.23	3000
–	–	–	M6x1	48	10	27.5	40	7	12	3000
–	–	–	M6x1	48	10	27.5	38	7.1	14	3000
11	5.5	–	M6x1	54	13	41	46	12.2	15.2	3000
–	–	–	M6x1	55	10	34	46	11.5	17.5	4000
–	–	–	M6x1	64	12	40.8	56	13	22.6	6000
–	–	–	M6x1	78	13	45	62	20.9	57.7	6000
–	–	–	M6x1	82	15	53	68	17.2	53.9	6000
–	–	–	M8x1	82	15	47.5	70	52.2	103.6	6000
–	–	–	M8x1	99	17	63	84	59.7	108.9	6000
–	–	–	M8x1	120	18	80	85	78.8	188.7	6000

SBC Precision Rolled Ball Screw

MBS Miniature Rolled Ball Screw



[MBS0601~1205]

Model No.	d1 (Nominal diameter)	Ph (Lead)	do (Ball circle diameter)	Da (Ball Diameter)	d2 (Root - diameter)	i (No. of circuits)	D1	D2 (PCD)	D3	D4
MBS 0601	6	1	6.3	0.8	5.5	3x1	13	21.5	27	3.4
MBS 0801	8	1	8.2	0.8	7.4	4x1	16	24	30	3.4
MBS 0802	8	2	8.4	1.2	7.2	3x1	16	24	30	3.4
MBS 0802.5	8	2.5	8.4	1.2	7.2	2.5x1	20	30	38	4.5
MBS 1204	12	4	12.4	2.381	10	3.5x1	28	39	48	5.5
MBS 1205	12	5	12.4	2	10.4	3.5x1	28	39	48	5.5
MBS 1210	12	10	12	2	10	2x1	30	40	45	4.5

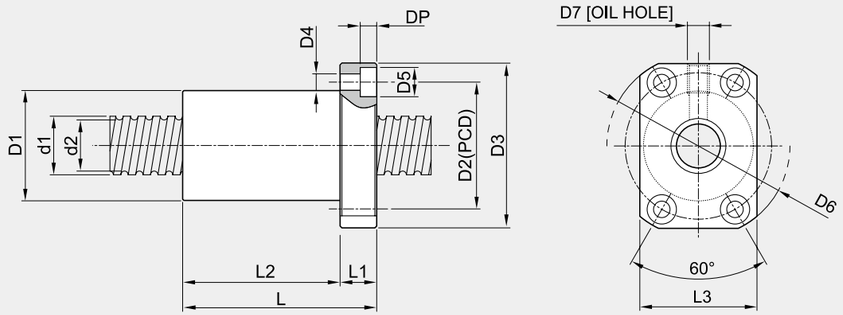
❶ Ca (Basic Dynamic load rating), Coa (Basic static load rating)

❷ MBS0601~1205 do not contain a seal. It is necessary to use a dust-prevention device.

❸ Corresponding table on surface coating

Model number	Nut	Screw
MBS0601	X	O
MBS0801, MBS0801, MBS0802.5	X	O
MBS1204, MBS1205, MBS1210	O	O

SBC Precision Rolled Ball Screw



[MBS1210]

(Unit : mm)

D5	DP	D6	D7	L	L1	L2	L3	Ca [kN]	Coa [kN]	Max. Length
–	–	–	–	15	3.5	11.5	17	0.71	1.18	900
–	–	–	–	16	4	12	18	0.95	1.91	1200
–	–	–	–	16	4	12	18	1.13	1.87	1200
–	–	–	–	21	5	16	23	1.48	2.27	1200
–	–	–	–	30	6	24	30	4.16	7.23	1400
–	–	–	–	35	6	29	30	6.49	10.15	1400
8	4.5	50	M6x1	40	10	30	32	2.5	3.59	3000

DIN Standard SBC Precision Rolled Ball Screw

Types and features

SBC Precision Rolled Ball Screw follows European DIN standards.

The screw shaft is rolled with high accuracy and then the raceways are ground to meet the P3(JIS: C3) grade.

These ball screws provide high rigidity, high accuracy, and smooth motion.

(1) European DIN standards

European DIN standard products follow the DIN 69 051/5 standard.

(2) High accuracy lead (P3, P5, T7)

High Accuracy lead s are available in P3, P5, and T7 grades.

(3) The ball raceways of the ball screw nut are all thread-ground

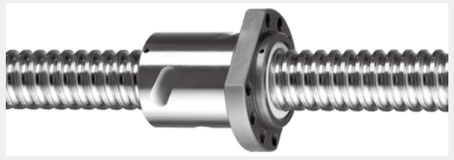
The thread form is finish ground to provide high rigidity, high accuracy and smooth motion.

(4) Always in stock

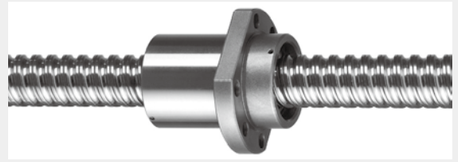
Ball Screws are always available for fast delivery time.

(5) High quality control

SBC provides high Quality Control to ensure the ball screws meet your expectations.



SDK (Precision rolled Ball Screw)



SDH (Long lead rolled Ball Screw)

DIN Standard SBC Precision Rolled Ball Screw

Screw Shaft Model No.

(Unit : mm)

Model No.	Diameter	Lead	Max. Length	Accuracy
RM1605	15.6	05	3000	P3, P5, T7
RM1610	15.9	10	3000	P3, P5, T7
RM1616	15.9	16	3000	P3, P5, T7
RM2005	19.6	05	4000	P3, P5, T7
RM2010	19.9	10	4000	P3, P5, T7
RM2020	19.6	20	4000	P3, P5, T7
RM2505	24.6	05	6000	P3, P5, T7
RM2510	24.6	10	6000	P3, P5, T7
RM2525	24.6	25	6000	P3, P5, T7
RM3205	31.6	05	6000	P3, P5, T7
RM3210	31.6	10	6000	P3, P5, T7
RM3220	31.6	20	6000	P3, P5, T7
RM3232	32	32	6000	P3, P5, T7
RM4005	39.6	05	6000	P3, P5, T7
RM4010	39.6	10	6000	P3, P5, T7
RM4020	39.6	20	6000	P3, P5, T7
RM4040	39.6	40	6000	P3, P5, T7
RM5010	49.5	10	6000	P3, P5, T7
RM6310	62.5	10	6000	P3, P5, T7

SBC Follows DIN and JIS Standards

DIN Standard	JIS Standard
P5	C5
T7	C7

DIN Standard SBC Precision Rolled Ball Screw

Ordering Example

[The Nut Ordering]

20 05 SDK – S – KR
[1] [2] [3] [4] [5]

[1] Diameter
[2] Lead
[3] Nut Type : SDK, SDH
[4] Preload : S (Clearance Type)
[5] Surface treatment : No symbol (standard), KR (Nut surface trearment)

※ When ordering only a nut, the preload is only S type (Clearance type).

[The Screw shaft Ordering]

RM 2005 – 1500L – T7 – RR
[1] [2] [3] [4]

[1] Model No.
[2] Screw shaft length
[3] Accuracy
[4] Surface treatment : No symbol (standard), RR (Screw surface trearment)

※ Refer to the specifications for the Model No.
※ Individual screw shafts are only available in the T7 precision grade.

DIN Standard SBC Precision Rolled Ball Screw

[Ordering]

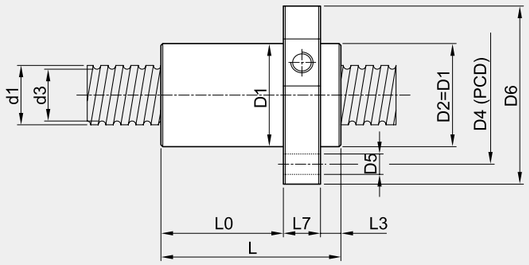
2005 SDK – A – 1 – 1300 / 1500 – T7 – AR
[1] [2] [3] [4] [5] [6] [7]

[1] Model No. : SDK, SDH
[2] Preload : S (Clearance Type), A (Non-backlash Type)
[3] Nut Quantity : Nut Quantity on Screw shaft
[4] Thread Length : No Symbol (No processing)
[5] Total Length
[6] Accuracy : P5, T7
[7] Surface treatment : No symbol (standard), AR(Nut and Screw), KR (Nut only) RR (Screw only)

※ A screw-nut assembly is recommended if high accuracy or rigidity is required.
※ For surface treatment, mark the type of surface treatment.
※ If end machining is required, please attach a drawing.
※ Refer to the specifications for the Accuracy.

DIN Standard SBC Precision Rolled Ball Screw

SDK Type Precision Rolled Ball Screw

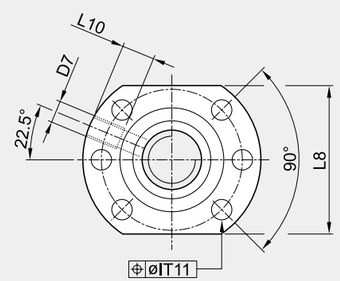


	d1 (Screw shaft outer diameter)	Ph (Lead)	do (Ball circle diameter)	Da (Ball Diameter)	d3 (Root - diameter)	i (No. of circuits)	Sa	D1g6	D4 (PCD)	D5	D6
SDK 1605	15.6	5	16.5	3.5	12.7	3	0.05	28	38	5.5	48
SDK 2005	19.6	5	20.5	3.5	16.7	3	0.05	36	47	6.6	58
SDK 2010	19.9	10	21	3.969	16.9	3	0.05	36	47	6.6	58
SDK 2505	24.6	5	25.5	3.5	21.7	3	0.05	40	51	6.6	62
SDK 2510	24.6	10	25.5	3.5	21.7	4	0.05	40	51	6.6	62
SDK 3205	31.6	5	32.5	3.5	28.7	4	0.05	50	65	9	80
SDK 3210	31.6	10	33	5.556	27.1	3	0.06	50	65	9	80
SDK 4005	39.6	5	40.5	3.5	36.7	5	0.06	63	78	9	93
SDK 4010	39.6	10	41.6	7.144	34.0	4	0.06	63	78	9	93
SDK 5010	49.5	10	51.5	7.144	43	4	0.06	75	93	11	110
SDK 6310	62.5	10	64.5	7.144	56.9	5	0.06	90	108	11	125

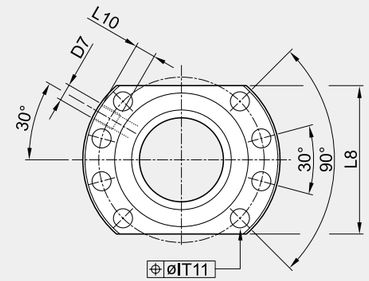
❶ Ca (Basic Dynamic load rating), Coa (Basic static load rating)

❷ Sa (Axial Backlash)

DIN Standard SBC Precision Rolled Ball Screw



[SDK1605~3210]



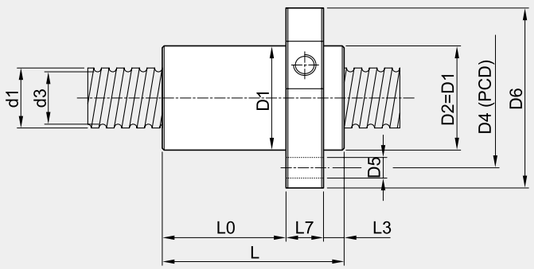
[SDK4005~8010]

(Unit : mm)

L±1	L0±1	L3-0.5	L7	L8	D7	L10	Ca [kN]	Coa [kN]	Max. Length	Nut Mass [kg]	Screw shaft Mass [kg/m]	Screw shaft Moment of Inertia [kg . m m²/m]
48.5	33	5.5	10	40	M6x1	8	9.5	10.9	3000	0.25	1.2	32
48.5	33	5.5	10	44	M6x1	8	11.5	15.5	4000	0.35	2.0	85
69	53	6.0	10	44	M6x1	8	13.6	19	4000	0.35	2.0	85
49	33	6.0	10	48	M6x1	8	13.1	20.2	5000	0.37	3.3	225
80	64	6.0	10	48	M6x1	8	19	38	5000	0.45	3.3	225
57	39	6.0	12	62	M6x1	8	19.3	36.3	6000	0.7	5.6	645
73	55	6.0	12	62	M6x1	8	26.4	39	6000	0.8	5.3	580
66	45	7.0	14	70	M8x1	10	26.3	59.2	6000	1.2	9.0	1650
88.5	67.5	7.0	14	70	M8x1	10	64.9	109	6000	1.4	8.3	1400
92	69	7.0	16	85	M8x1	10	66.4	134.3	6000	2	13.5	3700
103.5	78.5	7.0	18	95	M8x1	10	93.8	229.7	6000	3	22	9870

DIN Standard SBC Precision Rolled Ball Screw

SDH Type Long Lead Rolled Ball Screw

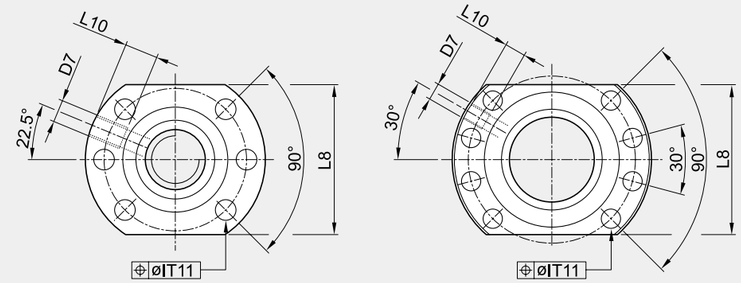


Model No.	d1 (Screw shaft outer diameter)	Ph (Lead)	do (Ball circle diameter)	Da (Ball Diameter)	d3 (Root - diameter)	i (No. of circuits)	Sa	D1g6	D4 (PCD)	D5	D6
SDH 1610	15.9	10	16.6	3.175	13.4	2.8	0.05	28	38	5.5	48
SDH 1616	15.9	16	16.6	3.175	13.4	3.6	0.05	28	38	5.5	48
SDH 2020	19.6	20	20.5	3.5	16.7	3.6	0.05	36	47	6.6	58
SDH 2525	24.6	25	25.5	3.5	21.7	3.6	0.05	40	51	6.6	62
SDH 3220	31.6	20	33	5.6	27.1	5.6	0.06	56	71	9	86
SDH 3232	32	32	33	4.7625	28.2	3.6	0.06	56	71	9	86
SDH 4020	39.6	20	41.4	5.55	35.2	5.6	0.06	63	78	9	93
SDH 4040	39.6	40	41.6	7.144	34	3.6	0.06	70	85	9	100

❶ Ca (Basic Dynamic load rating), Coa (Basic static load rating)

❷ Sa (Axial Backlash)

DIN Standard SBC Precision Rolled Ball Screw



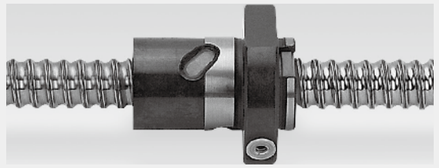
[SDH1610~3232] [SDH4020~6320]

(Unit : mm)

L±1	L0±1	L3-0.5	L7	L8	D7	L10	Ca [kN]	Coa [kN]	Max. Length	Nut Mass [kg]	Screw shaft Mass [kg/m]	Screw shaft Moment of Inertia [kg .m m²/m]
45	26	9	10	40	M6x1	8	7	12	3000	0.29	1.3	37
48	28	10	10	40	M6x1	8	7.1	14	3000	0.29	1.3	37
54	33	11	10	44	M6x1	8	10.8	18.6	4000	0.45	1.9	73
64	41	11	12	48	M6x1	8	13.1	26	5000	0.55	3.3	225
83	57	14	12	68	M6x1	8	47.2	83.2	6000	1.4	5.3	580
83	54	17	12	68	M6x1	8	17.2	53.9	6000	1.4	5.3	580
83	56	13	14	70	M8x1	10	52.2	103.6	6000	1.6	8.6	1520
102	67	21	14	77	M8x1	10	59.7	108.9	6000	2.4	8.4	1430

DIN Standard Precison Rolled Ball Screw

Types and features



FK Standard Rolled Ball Screw

FH Rolled Ball Screw

ZG Rolled Ball Screw

Ball Screw

DIN Standard Precison Rolled Ball Screw

Screw Shaft Model No.

(unit : mm)

Model No.	Diameter	Lead	Max. Length	Accuracy
RM1204	12	04	3000	P5, T7
RM1605	15.6	05	3000	P5, T7
RM2005	19.6	05	4000	P5, T7
RM2020	19.6	20	4000	P5, T7
RM2505	24.6	05	6000	P5, T7
RM2510	24.6	10	6000	P5, T7
RM2525	24.6	25	6000	P5, T7
RM3205	31.6	05	6000	P5, T7
RM3210	31.6	10	6000	P5, T7
RM3220	31.6	20	6000	P5, T7
RM4005	39.6	05	6000	P5, T7
RM4010	39.6	10	6000	P5, T7
RM4020	39.6	20	6000	P5, T7
RM4040	39.6	40	6000	P5, T7
RM5010	49.5	10	6000	P5, T7
RM5020	49.5	20	6000	P5, T7
RM6310	62.5	10	6000	P5, T7
RM6320	62.5	20	6000	P5, T7
RM8010	79.5	10	7000	T7

SBC Follows DIN and JIS Standards

DIN Standard	JIS Standard
P5	C5
T7	C7

DIN Standard Precison Rolled Ball Screw

Ordering Example

[The Nut Ordering]

20 05 FK – S – KR
[1] [2] [3] [4] [5]

[1] Diameter
[2] Lead
[3] Nut Type
[4] Preload : S (Clearance Type)
[5] Surface treatment : No symbol (standard), KR (Nut surface trearment)

※ When ordering only a nut, the preload is only S type (Clearance type).

[The Screw shaft Ordering]

RM 2005 – 1500L – T7 – RR
[1] [2] [3] [4]

[1] Model No.
[2] Screw shaft length
[3] Accuracy
[4] Surface treatment : No symbol (standard), RR (Screw surface trearment)

※ Refer to the specifications for the Model No.
※ Individual screw shafts are only available in the T7 precision grade.

DIN Standard Precison Rolled Ball Screw

[Ordering]

2005 FK – A – 1 – 1300 / 1500 – T7 – AR
[1] [2] [3] [4] [5] [6] [7]

[1] Model No.
[2] Preload : S (Clearance Type), A (Non-backlash Type)
[3] Nut Quantity : Nut Quantity on Screw shaft
[4] Thread Length : No Symbol (No processing)
[5] Total Length
[6] Accuracy : P5, T7
[7] Surface treatment : No symbol (standard), AR(Nut and Screw), KR (Nut only) RR (Screw only)

※ A screw-nut assembly is recommended if high accuracy or rigidity is required.
※ For surface treatment, mark the type of surface treatment.
※ If end machining is required, please attach a drawing.
※ Refer to the specifications for the Accuracy.

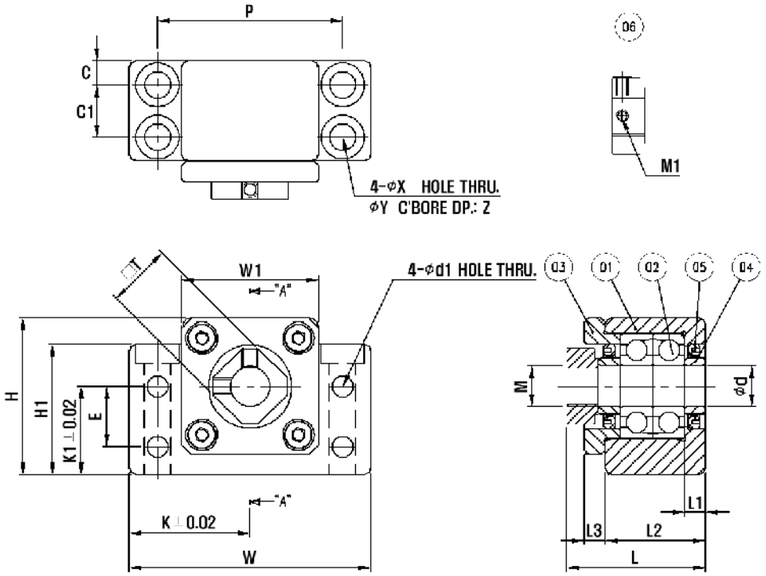
C

Support Unit

Fixed-End Support Unit / End Support Unit

FIXED-END SUPPORT UNIT

BK series



Model no.	Φd	W	W1	H	H1	K	K1	L	L1	L2	L3
BK10	10	60	34	39	32.5	30	22	34.5	5	25	5
BK12	12	60	34	43	32.5	30	25	34.5	5	25	5
BK15	15	70	40	48	38	35	28	38	6	27	6
BK17	17	86	50	64	55	43	39	51	7	35	9
BK20	20	88	52	60	50	44	34	51	8	35	8
BK25	25	106	64	80	70	53	48	63	9	42	12
BK30	30	128	76	89	78	64	51	70	9	45	14
BK35	35	140	88	96	79	70	52	79	12	50	14
BK40	40	160	100	110	90	80	60	91	15	61	18

(*1) Match pair for precision angular contact ball bearing.

Part no.	Name	Q'ty
01	Housing	1
02	Bearing(*1)	2
03	Pressure plate	1
04	collar	2
05	Seal	2
06	Lock nut	1

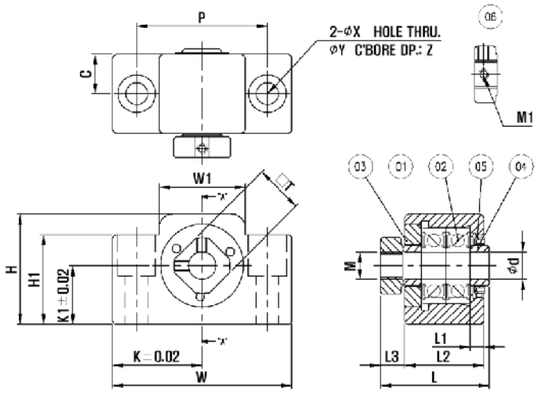
[Unit : mm, kg]

P	C	C1	ΦX	ΦY	Z	E	Φd1	T	M	M1	Weight
46	13	6	6.6	10.8	5	15	5.5	16	M10x1	M3	0.4
46	13	6	6.6	10.8	1.5	18	5.5	19	M12x1	M4	0.41
54	15	6	6.6	11	6.5	18	5.5	22	M15x1	M4	0.58
68	19	8	9	14	8.5	28	6.6	24	M17x1	M4	1.3
70	19	8	9	14	8.5	22	6.6	30	M20x1	M4	1.2
85	22	10	11	17	11	33	9	35	M25x1.5	M6	2.35
102	23	11	14	20	13	33	11	40	M30x1.5	M6	3.33
114	26	12	14	20	13	35	11	50	M35x1.5	M6	4.4
130	33	14	18	26	17.5	37	14	50	M40x1.5	M6	6.8

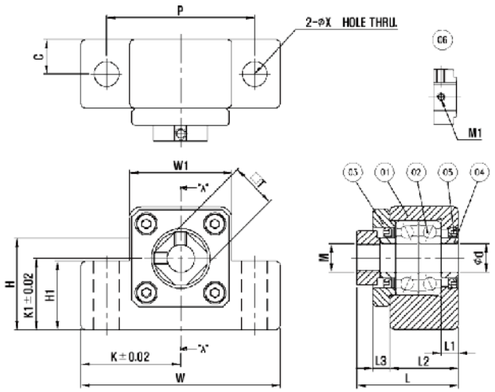
FIXED-END SUPPORT UNIT

EK series

[EK06, 08]



[EK10-20]



Part no.	Name	Q'ty
01	Housing	1
02	Bearing(*1)	2
03	Pressure plate(*2)	1 (2)
04	collar	2
05	Seal	2
06	Locknut	1

[Unit : mm, kg]

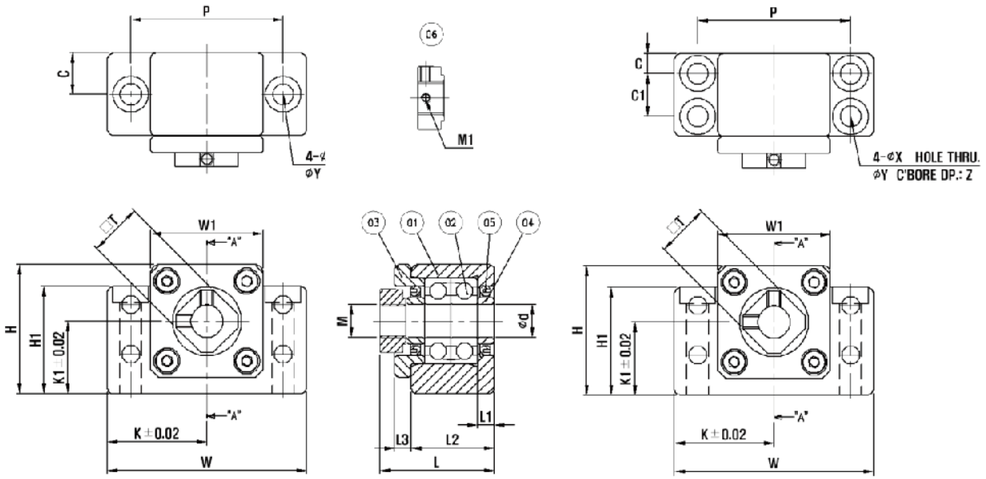
Model no.	Φd	W	W1	H	H1	K	K1	L	L1	L2
EK06	6	42	18	25	20	21	13	25.5	3.5	20
EK08	8	52	25	32	26	26	17	30	4	23
EK10-1	10	65	36	43	20	32.5	21	35.5	6	24
EK10	10	70	36	43	24	35	25	35.5	6	24
EK12	12	70	36	43	24	35	25	35.5	6	24
EK15	15	80	41	49	25	40	30	41	5	25
EK20	20	95	56	58	25	47.5	30	60	10	42

L3	P	C	ΦX	ΦY	Z	T	M	M1	Weight
5	30	10	5.5	9.5	11	12	M6x0.75	M3	0.15
5	38	11.5	6.6	11	12	14	M8x1	M3	0.26
6	52	12	6.6	–	–	16	M10x1	M3	0.45
9	52	12	9	–	–	16	M10x1	M3	0.45
8	52	12	9	–	–	19	M12x1	M4	0.44
12	60	12.5	11	–	–	22	M15x1	M4	0.56
14	75	21	11	–	–	30	M20x1	M4	1.34

(*1) Match pair for precision angular contact ball bearing.
(*2) Seal' ty EK6,8 (1seal) / EK10-2 seals)

FIXED-END SUPPORT UNIT

AK series

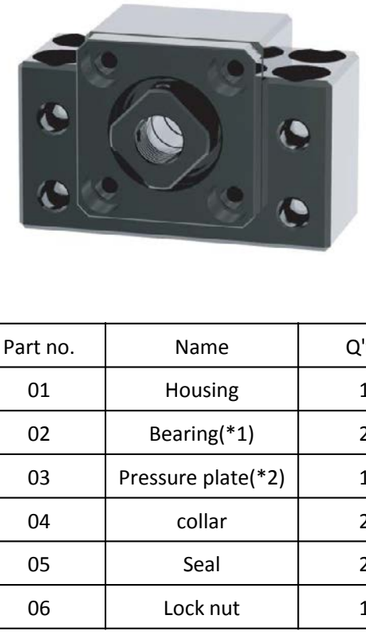


[AK10, 15]

[AK20-25]

Model no.	Φd	W	W1	H	H1	K	K1	L	L1	L2
AK10	10	70	36	43	35	35	25	25.5	6	24
AK12	12	70	36	43	35	35	25	30	6	24
AK15	15	80	41	49	40	40	30	35.5	5	25
AK20	20	95	56	58	45	47.5	30	35.5	10	42
AK25	25	105	66	68	25	52.5	35	35.5	14	48

(*1) Match pair for precision angular contact ball bearing.



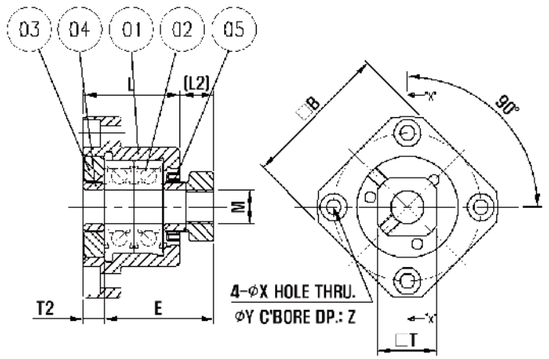
Part no.	Name	Q'ty
01	Housing	1
02	Bearing(*1)	2
03	Pressure plate(*2)	1
04	collar	2
05	Seal	2
06	Lock nut	1

[Unit : mm, kg]

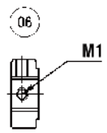
L3	P	C	C1	ΦX	ΦY	Z	T	M	M1	Weight
6	52	12	-	9	14	11	16	M6x0.75	M3	0.5
6	52	12	-	9	14	11	19	M12x1	M4	0.5
6	60	12.5	-	11	17	15	22	M15x1	M4	0.62
10	75	10	22	11	17	15	30	M20x1	M4	1.43
12	85	9	30	11	-	-	35	M25x1	M5	1.92

FIXED-END SUPPORT UNIT

FK series

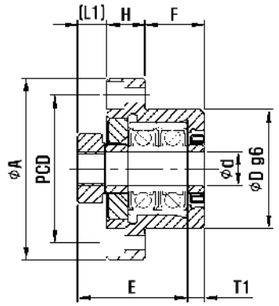


Assemble method "B"



Model no.	Φd	L	H	F	E	ΦD g6	A	PCD	B
FK05	5	16.5	6	10.5	18.5	20	34	26	26
FK06	5	20	7	13	22	22	36	28	28
FK08	8	23	9	14	26	28	43	35	35

(*1) Match pair for precision angular contact ball bearing.



Assemble method "A"

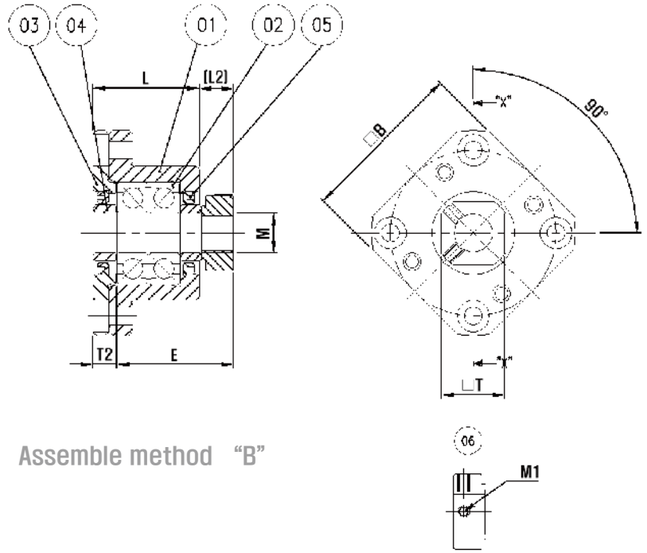
Part no.	Name	Q'ty
01	Housing	1
02	Bearing(*1)	2
03	Pressure plate	1
04	collar	2
05	Seal	2
06	Lock nut	1

[Unit : mm, kg]

"A" type		"B" type		ΦY	ΦY	Z	M	M1	T	Weight
L1	T1	L2	T2							
5.5	3.5	5	3	3.4	65	4	M5x0.5	M3	11	0.08
5.5	3.5	6.5	4.5	3.4	6.5	4	M6x0.75	M3	12	0.1
7	4	8	5	3.4	6.5	4	M8x1	M3	14	0.15

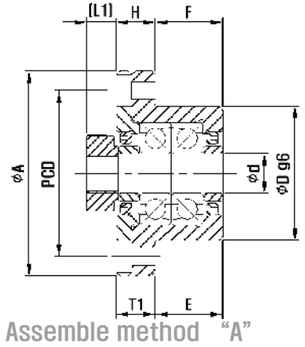
FIXED-END SUPPORT UNIT

FK series



Assemble method "B"

Model no.	Φd	L	H	F	E	ΦD g6	A	PCD	B
FK10	10	27	10	17	29.5	34	52	42	42
FK12	12	27	10	17	29.5	36	54	44	44
FK15	15	32	15	17	36	40	63	50	52
FK17	17	45	22	23	47	50	77	62	61
FK20	20	52	22	30	50	57	85	70	68
FK25	25	57	27	30	59	63	98	80	79
FK30	30	60	30	32	61	75	117	95	93



Assemble method "A"

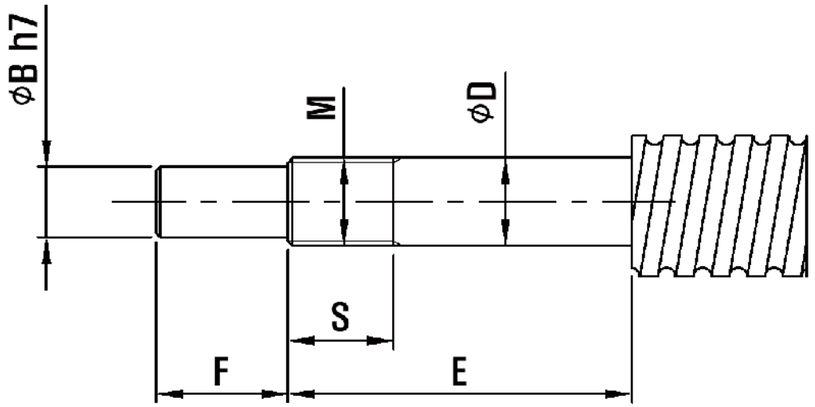
Part no.	Name	Q'ty
01	Housing	1
02	Bearing(*1)	2
03	Pressure plate	1
04	collar	2
05	Seal	2
06	Lock nut	1

[Unit : mm, kg]

"A" type		"B" type		ΦY	ΦY	Z	M	M1	T	Weight
L1	T1	L2	T2							
7.5	5	8.5	6	4.5	8	4	M10x1	M3	16	0.23
7.5	5	8.5	6	4.5	8	4	M12x1	M4	19	0.25
10	6	12	8	5..5	9.5	5	M15x1	M4	22	0.39
11	9	14	12	6.6	11	10	M17x1	M4	24	0.81
8	10	12	14	6.6	11	10	M20x1	M4	30	1.02
13	10	20	17	9	15	13	M25x1.5	M5	35	1.48
11	12	17	18	11	17.5	15	M30x1.5	M6	40	2.32

FIXED-END SUPPORT UNIT

For support unit type BK fixed side



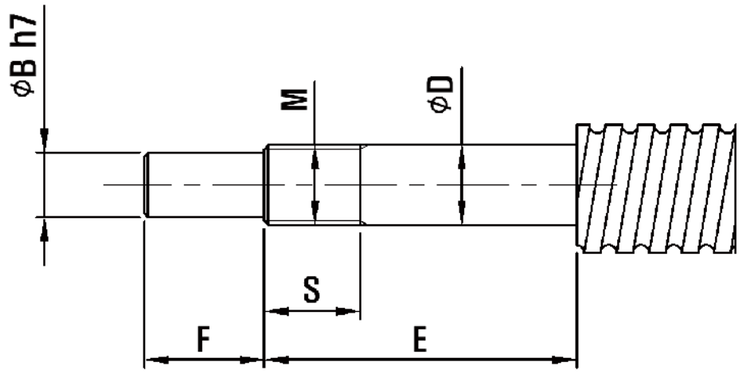
[Unit : mm]

Model No.	Use Screw shaft diameter	D	B
BK10	Φ12, Φ14, Φ15	10	8
BK12	Φ14, Φ15, Φ16	12	10
BK15	Φ18, Φ20	15	12
BK17	Φ20, Φ25	17	15
BK20	Φ25, Φ28	20	17
BK25	Φ32, Φ36	25	20
BK30	Φ36, Φ40	30	25
BK35	Φ45	35	30
BK40	Φ50	40	35

E	F	M	S	Collar Length
40	15	M10x1	16	5.5
39	15	M12x1	14	5.5
40	20	M15x1	12	6
53	23	M17x1	17	7
53	25	M20x1	15	8
64	30	M25x1.5	18	9
72	38	M30x1.5	25	9
83	45	M35x1.5	28	12
98	50	M40x1.5	35	15

FIXED-END SUPPORT UNIT

For support unit type FK and EK and AK fixed side



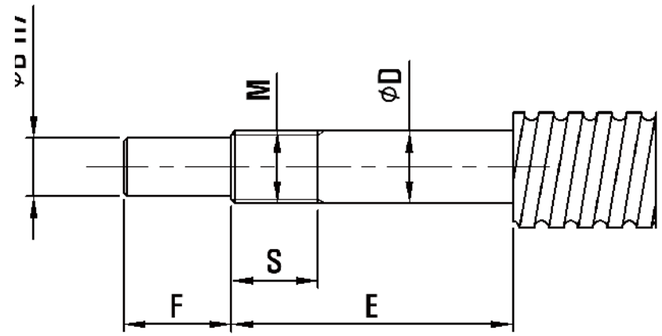
[Unit : mm]

Model No.			Use Screw shaft diameter	D	B
FK05	-	-	Φ8	5	4
FK06	EK06	-	Φ8	6	4
FK08	EK08	-	Φ10, Φ12	8	6
FK10	EK10	AK10	Φ12, Φ14, Φ15	10	8
FK12	EK12	AK12	Φ14, Φ15, Φ16	12	10
FK15	EK15	AK15	Φ18, Φ20	15	12
FK17	-	-	Φ20, Φ25	17	15
FK20	EK20	AK20	Φ25, Φ28	20	17
FK25	-	AK25	Φ32, Φ36	25	20
FK30	-	-	Φ36, Φ40	30	25

E	F	M	S	Collar Length
23	6	M5x0.75	7	3.5
28	8	M6x0.75	10	5
33	9	M8x1	10	5.5
36	15	M10x1	11	5.5
36	15	M12x1	11	5.5
49	20	M15x1	13	10
59	23	M17x1	16	10
64	25	M20x1	16	11
76	30	M25x1.5	20	14
72	38	M30x1.5	25	9

FIXED-END SUPPORT UNIT

For support unit type FK and EK and AK fixed side



Model No.			Use Screw shaft diameter	D	B
FK05	-	-	Φ8	5	4
FK06	EK06	-	Φ8	6	4
FK08	EK08	-	Φ10, Φ12	8	6
FK10	EK10	AK10	Φ12, Φ14, Φ15	10	8
FK12	EK12	AK12	Φ14, Φ15, Φ16	12	10
FK15	EK15	AK15	Φ18, Φ20	15	12
FK17	-	-	Φ20, Φ25	17	15
FK20	EK20	AK20	Φ25, Φ28	20	17
FK25	-	AK25	Φ32, Φ36	25	20
FK30	-	-	Φ36, Φ40	30	25

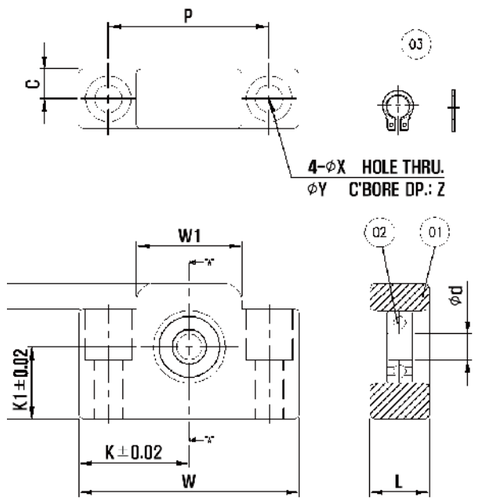
[Unit : mm]

E	F	M	S	Collar Length
23	6	M5x0.75	7	3.5
28	8	M6x0.75	10	5
33	9	M8x1	10	5.5
36	15	M10x1	11	5.5
36	15	M12x1	11	5.5
49	20	M15x1	13	10
59	23	M17x1	16	10
64	25	M20x1	16	11
76	30	M25x1.5	20	14
72	38	M30x1.5	25	9

END SUPPORT UNIT

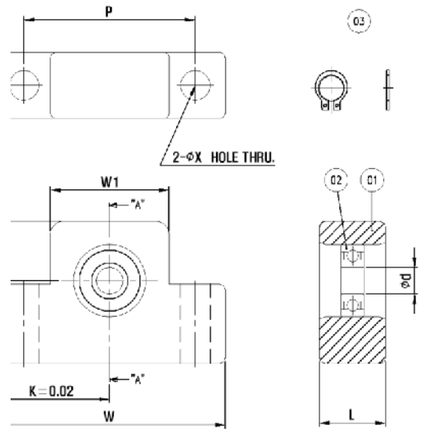
EF series

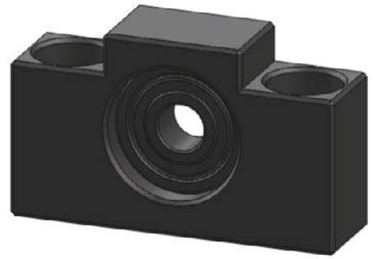
[EF06, 08]



Model no.	Φd	W	W1	K	K1	H	H1
EF06	6	42	18	21	13	25	20
EF08	6	52	25	26	17	32	26
EF10	8	70	36	35	25	43	24
EF12	10	70	36	35	25	43	24
EF15	15	80	41	40	30	49	25
EF20	20	95	56	47.5	30	58	25

[EF10-20]





Part no.	Name	Q'ty
01	Housing	1
02	Bearing	2
03	Pressure plate	1

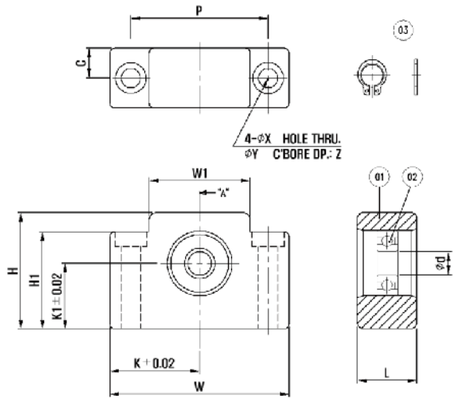
[Unit : mm, kg]

L	P	C	ΦX	ΦY	Z	Weight
12	30	6	5.5	9.5	11	0.1
14	38	7	6.6	11	12	0.15
20	52	10	9	-	-	0.33
20	52	10	9	-	-	0.32
20	60	10	9	-	-	0.38
26	75	13	11	-	-	0.64

END SUPPORT UNIT

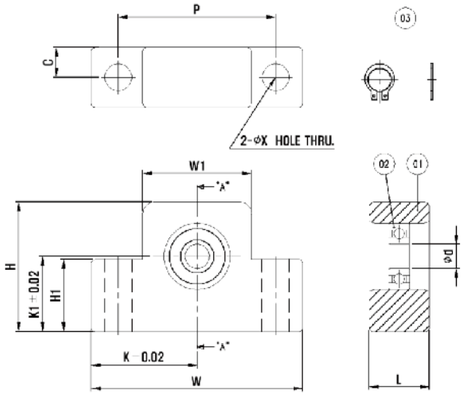
AF series

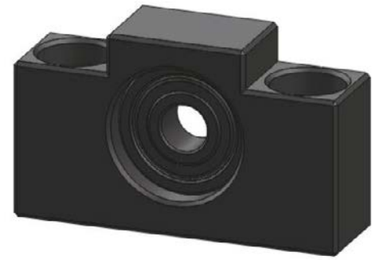
[AF10-20]



Model no.	Φd	W	W1	K	K1	H
AF10	8	70	36	35	25	43
AF12	10	70	36	35	25	43
AF15	15	80	41	40	30	49
AF20	20	95	56	47.5	30	58
AF25	25	105	66	52.5	35	68

[AF25]





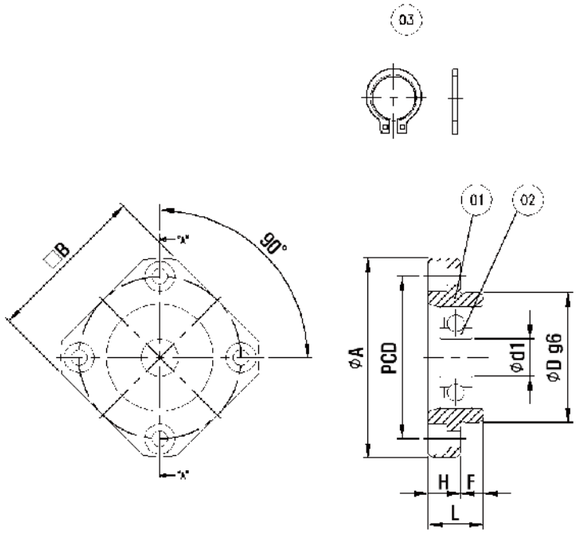
Part no.	Name	Q'ty
01	Housing	1
02	Bearing	2
03	Pressure plate	1

[Unit : mm, kg]

H1	L	P	C	ΦX	ΦY	Z	Weight
35	20	52	10	9	14	11	0.36
35	20	52	10	9	14	11	0.36
40	20	60	10	9	14	11	0.44
45	26	75	13	11	17	15	0.73
25	30	85	15	11	-	-	0.95

END SUPPORT UNIT

FF series



Model no.	Φd	ΦA	B	L	H	F
FF06	6	36	28	10	6	4
FF10	8	43	35	12	7	5
FF12	10	52	42	15	7	8
FF15	15	63	52	17	9	8
FF17	17	77	61	20	11	9
FF20	20	85	68	20	11	9
FF25	25	98	79	24	14	10
FF30	30	117	93	27	18	9

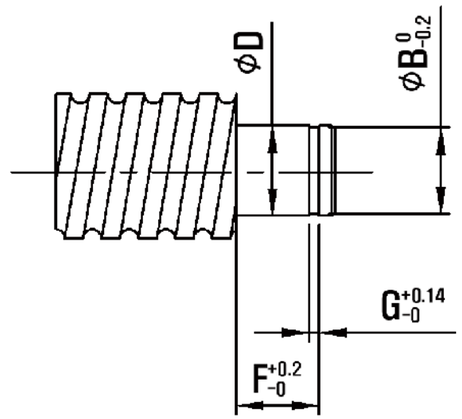
Part no.	Name	Q'ty
01	Housing	1
02	Bearing	2
03	Pressure plate	1

[Unit : mm, kg]

ΦD g6	PCD	ΦX	ΦY	Z	Weight
22	28	3.4	6.5	4	0.06
28	35	3.4	6.5	4	0.1
34	42	4.5	8	4	0.13
40	50	5.5	9.5	5.5	0.2
50	62	6.6	11	6.5	0.33
57	70	6.6	11	6.5	0.43
63	80	9	14	85	0.66
75	95	11	17	11	1.03

END SUPPORT UNIT

For support unit type FF and EF and AF and BF floated side



Model No.				Use Screw shaft diameter
FF06	EF06	-	-	Φ8
-	EF08	-	-	Φ10
FF10	EF10	BF10	AF10	Φ12, Φ14, Φ15
FF12	EF12	BF12	AF12	Φ14, Φ15, Φ16
FF15	EF15	BF15	AF15	Φ18, Φ20
FF17	-	BF17	-	Φ20, Φ25
-	-	BF20	-	Φ25, Φ28, Φ30
FF20	EF20	-	AF20	Φ25, Φ28, Φ30
FF25	-	BF25	AF25	Φ30, Φ32, Φ36
FF30	-	BF30	-	Φ36, Φ40
-	-	BF35	-	Φ40, Φ45
-	-	BF40	-	Φ50

[Unit : mm]

D	E	B	F	G
6	9	5.7	6.8	0.8
6	9	5.7	6.8	0.8
8	10	7.6	7.9	0.9
10	11	9.6	9.15	1.15
15	13	14.3	10.15	1.15
17	16	16.2	13.15	1.15
20	16	19	13.35	1.35
20	19	19	15.35	1.35
25	20	23.9	16.35	1.35
30	21	28.6	17.75	1.75
35	22	33	18.75	1.75
40	23	38	19.95	1.95

END SUPPORT UNIT

Bearing use with support unit

Model No.	Bearing
FF06, EF06	606 ZZ
FF08, EF08	606 ZZ
BF10, FF10, EF10, AF10	608 ZZ
EF12, FF12, EF12, AF12	6000 ZZ
BF15, FF15, EF15, AF15	6002 ZZ
BF17, FF17	6203 ZZ
BF20, EK20, FK20, AK20	6004 ZZ
BF25, FF25, AF25	6205 ZZ
BF30, FF30	6206 ZZ
BF35	6207 ZZ
BF40	6208 ZZ

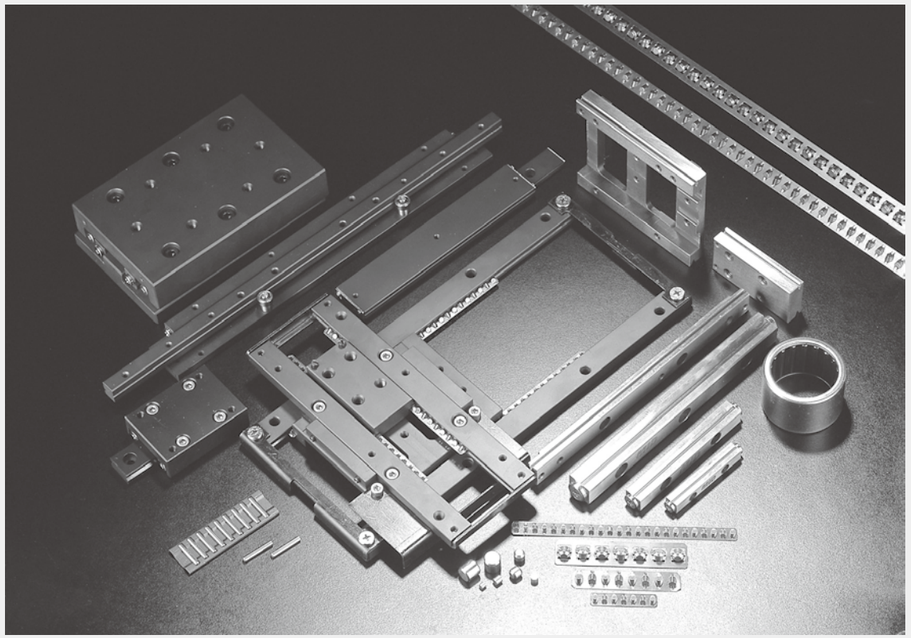
Cross Roller Guide

Technical Data / Cross Roller Guide SCVR Type /
Cross Roller Table SCVRT Type, SCVRU Type

CROSS ROLLER GUIDE

SBC cross roller guides are mechanical bearings where a roller cage is assembled between two rails with “V” grooved raceway. Since the rollers are incorporated at right angles to each other, they can carry loads in all directions to create a highly rigid, high precision, compact linear motion guide.

The cross roller guide is commonly used in : Measuring and Optical instruments and other applications requiring high precision linear motion.



[SBC Cross roller products]

- CROSS ROLLER GUIDE : SCVR
  A combination of four rails and two cages.
- CROSS ROLLER TABLE : SCVRT, SCVRU
  A stage using cross roller guides for precision motion.

Basic dynamic load rating

The basic dynamic load rating is the guide’ s load capacity with a constant direction and constant magnitude load where a group of identical cross roller guides operating under the same conditions will last for at least 100Km of travel.

[Basic dynamic load rating symbol]

SCVR (Cross roller guide) : Cz (kN)

SCVRT, SCVRU (Cross roller table) : C (kN)

Basic static load rating

The basic static load rating is the guide’ s load capacity with a constant direction and constant magnitude load where the total permanent deformation of roller and raceway equals 0.0001 times the roller diameter.

[Basic static load rating symbol]

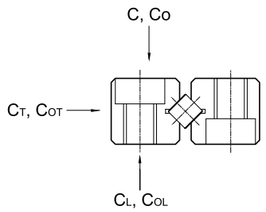
SCVR (Cross roller guide) : Coz (kN)

SCVRT, SCVRU(Cross roller table) : Co (kN)

Rated loads in all directions

[SCVR(Cross roller guide) rated load]

The dynamic load rating and static load rating in the tables is per roller. To calculate the load capacity for the bearing set, use the equation below.



$C_O = C_L = \left(\frac{Z}{2}\right)^{\frac{3}{4}} \times C_Z,\ C_T = 2C$

$C_O = C_{OL} = \left(\frac{Z}{2}\right)^{\frac{3}{4}} \times C_{OZ},\ C_{OT} = 2C_O$

($\frac{Z}{2}$ Delete below the decimal point.)

[SCVRT, SCVRU(Cross roller table) rated load]

The rated loads of models SCVRT and SCVRU are equal in all four directions (radial, reverse radial, lateral directions) and their rated load values are same as C and Co from the specification table.

Static Safety Factors (fs)

When Cross roller guide products are used in applications, they may carry unexpected loads. For example, reciprocating machines typically create moment loads because of an offset center-of-gravity and the acceleration.

When selecting the right cross roller guide products, consider all of the loads.

$$f_S = \frac{C_O}{P}$$ (Radial Load)

$$f_S = \frac{M_O}{M}$$ (Moment Load)

- Co : Basic dynamic load rating
- P : Calculated load
- Mo : Static permissible moment (Mpo, Mro, Myo)
- M : Loaded moment

(Reference value of fs)

Operating conditions	Load conditions	fs
Occasional operating	Small impact	1.0 ~ 1.3
	Impact or Twisting loa	2.0 ~ 3.0
Ordinary operating	Normal load	1.0 ~ 1.5
	Impact or Twisting load	2.5 ~ 7.0

Life Calculation

The life calculation of a cross roller guide is calculated using the equation below.

[Nominal life]

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P} \right)^{\frac{10}{3}} X\ 100$$

- L (km) : Nominal life
- P (N) : Calculated load
- C (N) : Basic dynamic load rating
- f_T : Temperature factor
- fw : Load factor

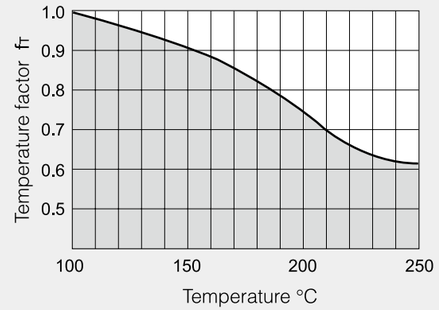
Temperature factor (f_T)

If the temperature of the environment is over 100°C, the bearing capacity must be derated according to the chart.

The temperature factor (f_T) should be utilized.

※ Under 80°C, fT= 1.0

※ Over 80°C, Contact SBC



Load factor (fw)

Reciprocating machines typically create vibrations which are very difficult to calculate precisely. Please refer to the following table to compensate for these vibrations.

Vibration and Impact	Velocity (V)	Load factor f_w
Very slight	Very low $V \leqq 0.25$m/s	1 ~ 1.2
Slight	Low $0.25 < V \leqq 1.0$m/s	1.2 ~ 1.5
Moderate	Medium $1.0 < V \leqq 2.0$m/s	1.5 ~ 2.0
Strong	High $V > 2.0$m/s	2.0 ~ 3.5

[Calculating Service life time]

After the nominal life in Km is calculated, the stroke and reciprocation frequency can be used to calculate the service life time using the equation below.

- L_h (h) : Service life time
- L (km) : Nominal life
- ℓ_s (mm) : Stroke
- n_1 (min^{-1}) : Reciprocation cycles per minute

$$L_h = \frac{L \times 10^6}{2 \times \ell_s \times n_1 \times 60}$$

Clearance and Preload

It is easy to adjust the preload of a cross roller guide, please refer to preload adjustment section of the catalog.

Accuracy

Refer to the catalog page of the specific model number for the specified accuracy.

Mounting method

Refer to the catalog pages of each model no.

Lubrication

Prevent abrasion and generation of heat, please use grease to lubricate properly.

[Grease lubrication]

❶ Clean before lubricating with grease
Before lubricating the raceways with grease, the anti-rust oil must be removed. Mixing anti-rust oil and grease can reduce the effectiveness of the grease.

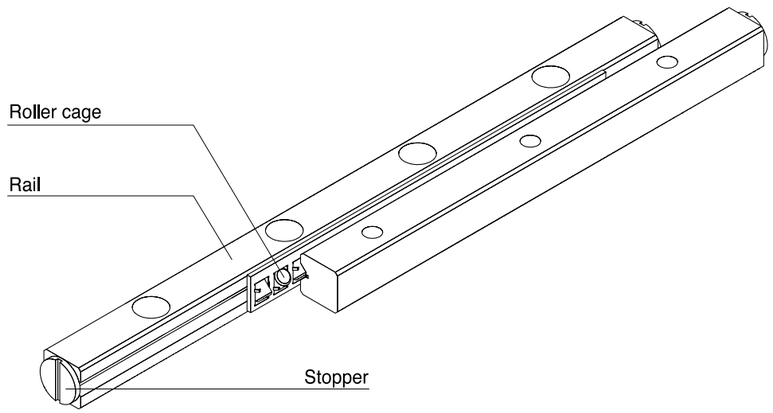
❷ Recommended grease
Lithium-based grease.

[Oil lubrication]

When lubricating with oil, the anti-rust oil does not need to be removed prior to lubrication.
We recommend to using lubricant: VG15~100, ISO Viscosity grades

Cross Roller Guide SCVR Type

Structure and Features



SCVR type is a liner guide where the ball cage is assembled to between the rails with “V” grooved raceway. Since the rollers are incorporated at right angles to each other, they can carry loads in all directions to form a highly rigid, high precision, compact linear motion guide.

[High rigidity]

SBC cross roller guides have no clearance and can be preloaded easily. They have high rigidity due to roller’s long contact length and preload.

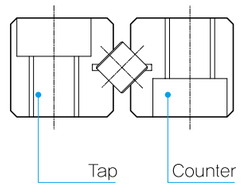
[Smooth movement]

SBC cross roller guides have high precision raceways, where precision rollers are spaced apart in a roller cage creating smooth movement with a low coefficient of friction.

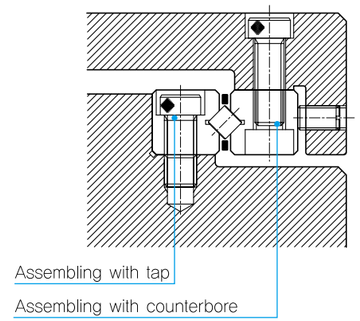
Cross Roller Guide SCVR Type

[Easy mounting]

Since mounting holes in raceways are counter bored with tapped holes, it is possible to mount the guide in both directions.



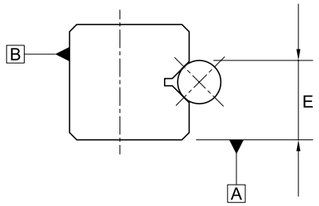
(Dedicated rail mounting hole)

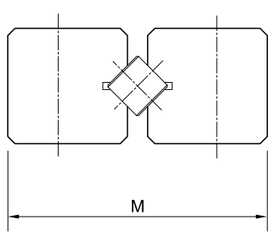


(How to mount bolts on dedicated rails)

Cross Roller Guide SCVR Type

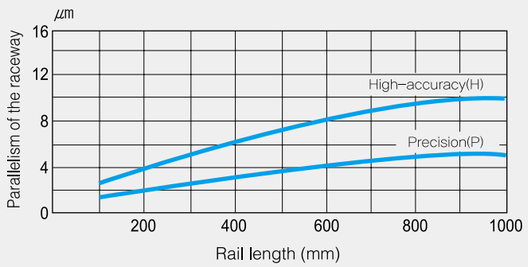
Accuracy Standards





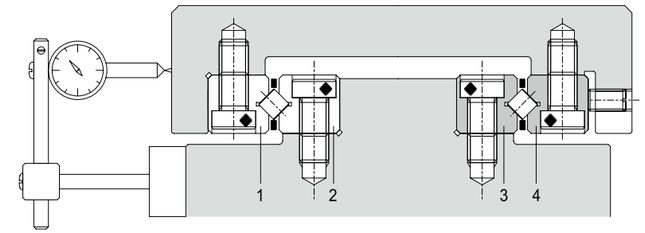
Accuracy grades	H (High-accuracy)	P (Precision)
Parallelism of the raceway against Surfaces A and B	See Graph	
Dimensional tolerance in height E	±0.02	±0.01
Difference in height E (*)	0.01	0.005
Dimensional tolerance in width M	0 ~ -0.2	0 ~ -0.1

(*The difference in height E applies to four rails used on the same plane.)



Cross Roller Guide SCVR Type

Mounting Method



❶ Install the rails 2 and 3 to base and rail 1 to table. Tighten the rail-mounting bolts ensuring the rails are firmly against the mounting surfaces.

❷ Temporarily mount the rail 4 to the table.
(※ When designing the system, please remember that the rail must be mounted and tightened after assembly)

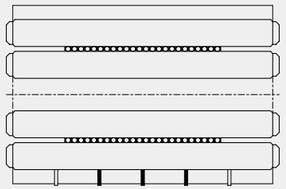
❸ Set the base and table according to G-8 and insert the roller cages. If the cages will not fit due to clearance, move the rail 4 slightly to create more clearance and insert cages.

❹ Set a dial gauge like G-8. While moving the table slowly back and forth, set all preloading bolts until there is no clearance.

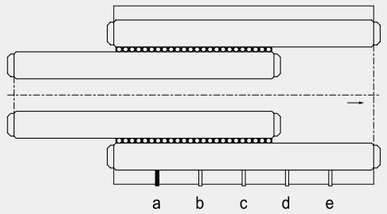
❺ Install end stops in the ends of the rails.

❻ Reset the cage position to get required stroke while moving table.

❼ Position roller cage in the center of the rail as in G-9. Tighten the preload bolts b, c, d evenly with a torque wrench within the area of roller until dial gauge shows desired value.
(※ The value of dial gauge is same as the preload of one roller.)



❽ Move table like G-9 and tighten the rest of the adjusting bolts a,e the same as adjusting bolts b,c,d.

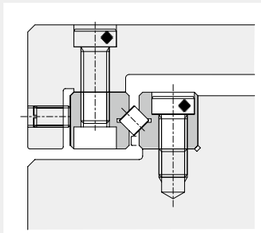


[Assembling two or more units]

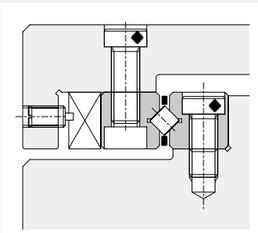
When mounting two or more units, first gauge the tightening torque of the adjustment bolts for the first unit or the sliding resistance of the first unit. And then, install the second unit so that their tightening torques or sliding resistances equal that of the first unit. In this method, almost the same preload can be provided.

Clearance adjusting

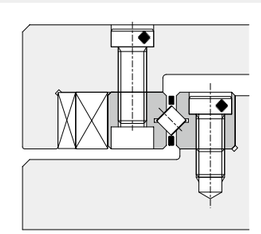
Design the preload method to uniformly preload the rail over the entire length.



❶ Normal



❷ Using pressing plate



❸ Using tapered gibs

❶ Normal : Most common method of preloading using a setscrew to push the rail.
❷ Press plate : A press plate should be used when higher precision and smoothness is needed
❸ Tapered gibs : Use tapered gibs when high rigidity and precision is needed.

Preload

Too much preload may cause indentation (brinelling) and reduce the service life. The acceptable preload per roller is shown in the specification table. Tighten the adjustment bolts while watching the displacement of the roller contact area.

Accuracy of the Mounting Surface

To acquire a high level of running accuracy a high level of parallelism and straightness is required in the mounting surfaces. The parallelism and flatness of the rail mounting surface should be completed by grinding to at least the same precision as the rail (See page no. ⓔ/10)

Additionally, the rails must be securely mounted up against the mounting surfaces.

Cross Roller Guide SCVR Type

Precautions

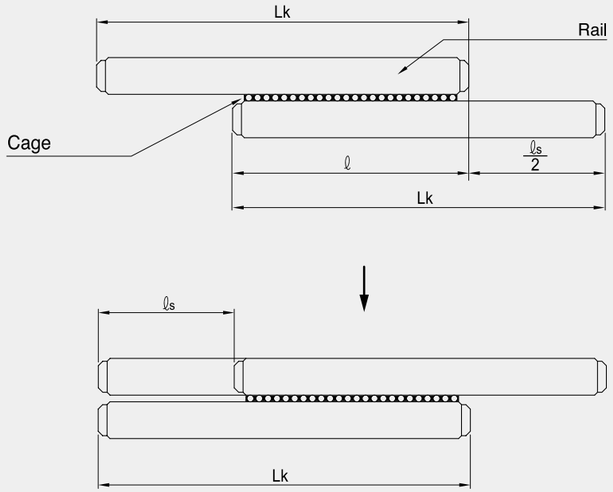
※ When using a cross roller guide, please follow these precautions.

[Rail length]

The roller cage move the half the travel distance of the table in the same direction.

If the cage length is ℓs, the rail length (Lk) must match the following equation to prevent the cage from crashing into the end of the rail.

$$Lk \leq \ell + \frac{\ell s}{2}$$



Cross Roller Guide SCVR Type

[Cage Creep]

The roller cage moves accurately but it may drift off center over time (cage creep) due to vibrations, inertia or impact.

Please mount an external stop for the table. Do not depend on the rail end stops to control the travel.

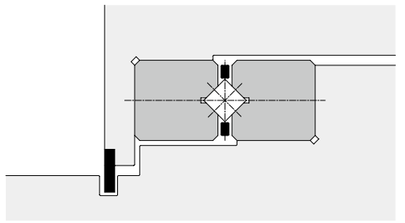
[Rail End Stops]

The purpose of Rail End Stops is to prevent the roller cage from coming outside of the rail. The rail end stops are attached to the end of the rails.

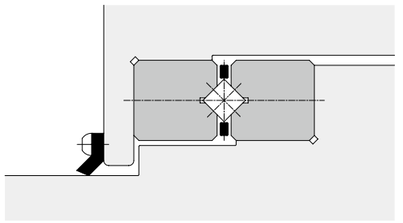
If the cages frequently bump into the rail end stops, they may become damaged or loosen the rail end stops.

[Protection against dust]

To prevent the cross roller guide from dust and debris, side dust protections as shown in figure G-13 are available. For the other part of guide, consider using bellows or telescopic cover.



Labyrinth cover

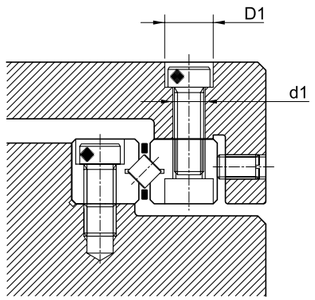


Wiper seal

Cross Roller Guide SCVR Type

Design Mounting Bolt

The holes of the bolt(D1, d1) should be designed carefully for the preload adjustment.



Cross Roller Guide SCVR Type

Ordering Example

[Cross roller guide]

SCVR 2 P – 75 x 13Z – R
[1] [2] [3] [4] [5]

[1] Model No. : SCVR 1, 2, 3, 4, 6, 9 type
[2] Accuracy Grade : H(High), P(Precision)
[3] Rail Length
[4] Number of Rollers
[5] Surface treatment : No Symbol (Standard), R (Surface treatment)

※ A combination of four rails and two cages.
※ When ordering surface treatment, please fill out Symbols for surface treatment.
❶ Standard (no treatment), Black Chrome coating (Raydent treatment), Fluorocarbon resin coating, Hard Chrome plating
❷ Contact SBC for special surface treatment.

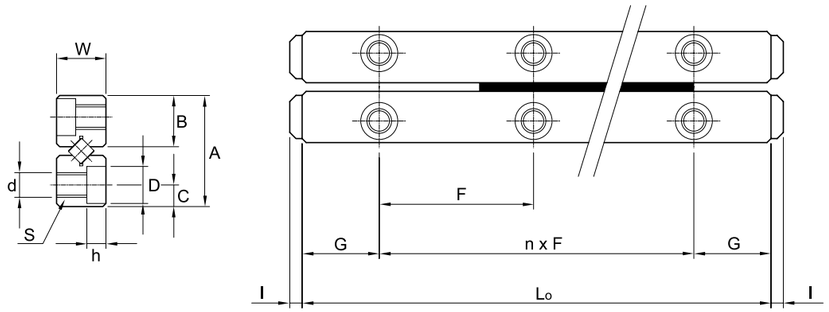
[Roller Cage]

SCVR 2 x 13Z
[1] [2]

[1] Model No. : SCVR 1, 2, 3, 4, 6, 9 type
[2] Number of Rollers

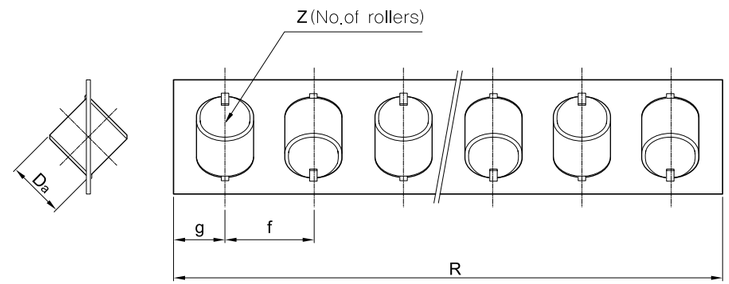
Cross Roller Guide SCVR Type

SCVR1 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR1-20x5Z	12	8.5	4	20	1x10	5	3.9	1.8	M2	1.65
SCVR1-30x7Z	22			30	2x10					
SCVR1-40x10Z	27			40	3x10					
SCVR1-50x13Z	32			50	4x10					
SCVR1-60x16Z	37			60	5x10					
SCVR1-70x19Z	42			70	6x10					
SCVR1-80x21Z	52			80	7x10					

Cross Roller Guide SCVR Type

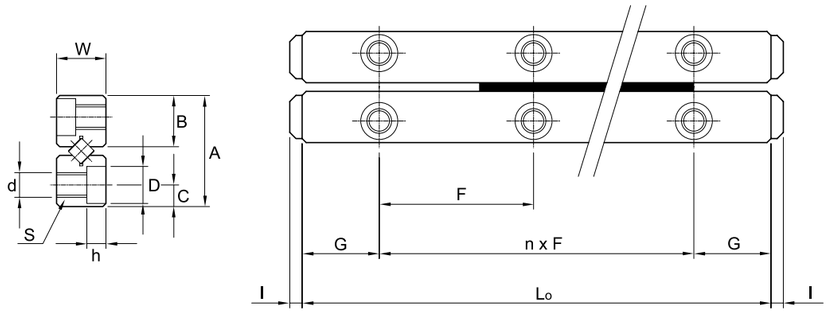


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
3	1.4	1.6	1.5	14	2	2.5	5	-0.002	0.098	0.069	0.11
				19			7				
				26.5			10				
				34			13				
				41.5			16				
				49			19				
				54			21				

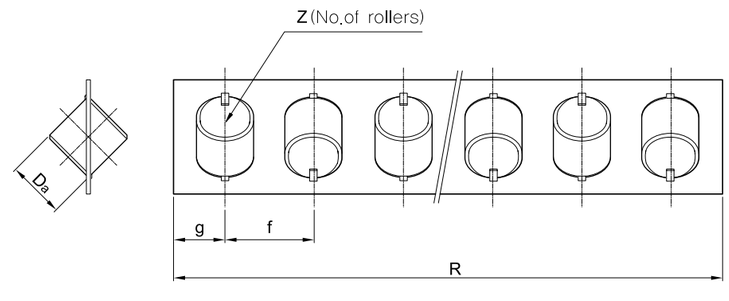
Cross Roller Guide SCVR Type

SCVR2 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR2-30x5Z	18	12	6	30	1x15	7.5	5.6	2.5	M3	2.55
SCVR2-45x8Z	24			45	2x15					
SCVR2-60x11Z	30			60	3x15					
SCVR2-75x13Z	44			75	4x15					
SCVR2-90x16Z	50			90	5x15					
SCVR2-105x18Z	64			105	6x15					
SCVR2-120x21Z	70			120	7x15					
SCVR2-135x23Z	84			135	8x15					
SCVR2-150x26Z	90			150	9x15					
SCVR2-165x29Z	96			165	10x15					
SCVR2-180x32Z	102			180	11x15					

Cross Roller Guide SCVR Type

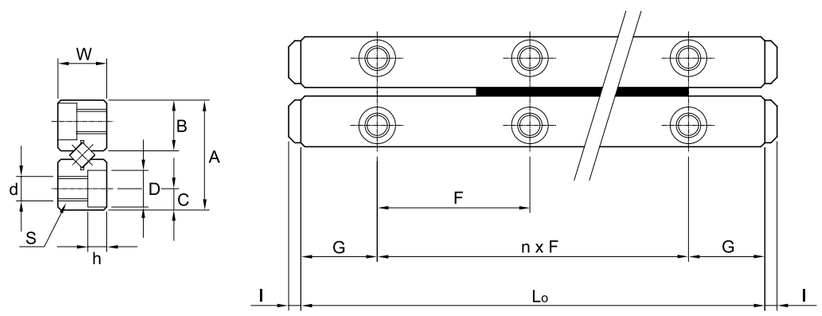


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
4.4	2	1.5	2	21	2.5	4	5	-0.003	0.176	0.127	0.23
				33			8				
				45			11				
				53			13				
				65			16				
				73			18				
				85			21				
				93			23				
				105			26				
				117			29				
				129			32				

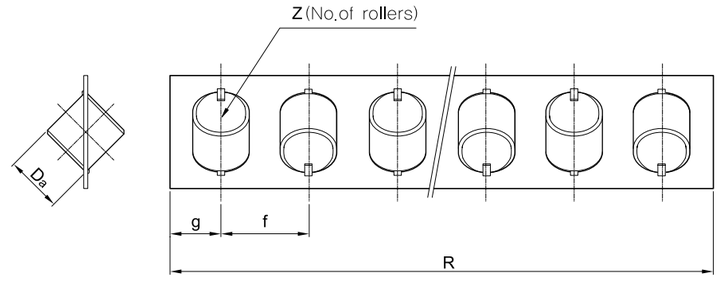
Cross Roller Guide SCVR Type

SCVR3 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR3-50x7Z	28	18	8	50	1x25	12.5	8.3	3.5	M4	3.8
SCVR3-75x10Z	48			75	2x25					
SCVR3-100x14Z	58			100	3x25					
SCVR3-125x17Z	78			125	4x25					
SCVR3-150x21Z	88			150	5x25					
SCVR3-175x24Z	108			175	6x25					
SCVR3-200x28Z	118			200	7x25					
SCVR3-225x31Z	138			225	8x25					
SCVR3-250x35Z	148			250	9x25					
SCVR3-275x38Z	168			275	10x25					
SCVR3-300x42Z	178			300	11x25					

Cross Roller Guide SCVR Type

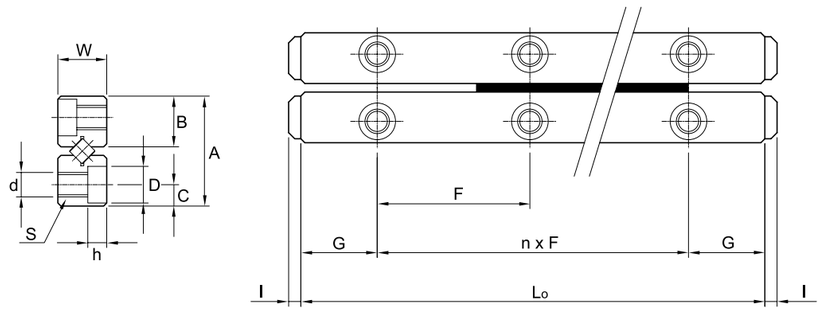


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
6	3.1	2	3	36	3	5	7	-0.004	0.363	0.275	0.45
				51			10				
				71			14				
				86			17				
				106			21				
				121			24				
				141			28				
				156			31				
				176			35				
				191			38				
				211			42				

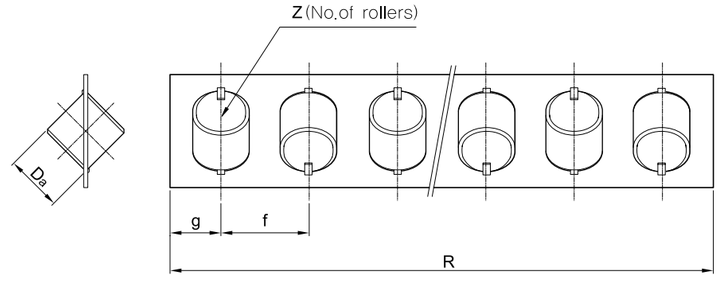
Cross Roller Guide SCVR Type

SCVR4 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR4-80x7Z	58	22	11	80	1x40	20	10.2	4.5	M5	4.3
SCVR4-120x11Z	82			120	2x40					
SCVR4-160x15Z	106			160	3x40					
SCVR4-200x19Z	130			200	4x40					
SCVR4-240x23Z	154			240	5x40					
SCVR4-280x27Z	178			280	6x40					
SCVR4-320x31Z	202			320	7x40					
SCVR4-360x35Z	226			360	8x40					
SCVR4-400x39Z	250			400	9x40					
SCVR4-440x43Z	274			400	10x40					
SCVR4-480x47Z	298			480	11x40					

Cross Roller Guide SCVR Type

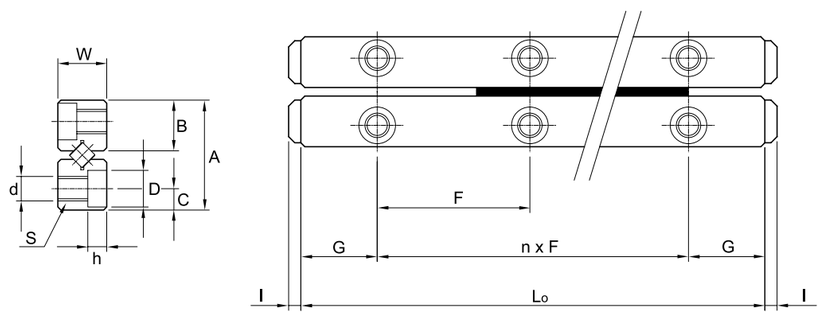


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
8	4.2	2	4	51	4.5	7	7	-0.005	0.764	0.637	0.8
				79			11				
				107			15				
				135			19				
				163			23				
				191			27				
				219			31				
				247			35				
				275			39				
				303			43				
				331			47				

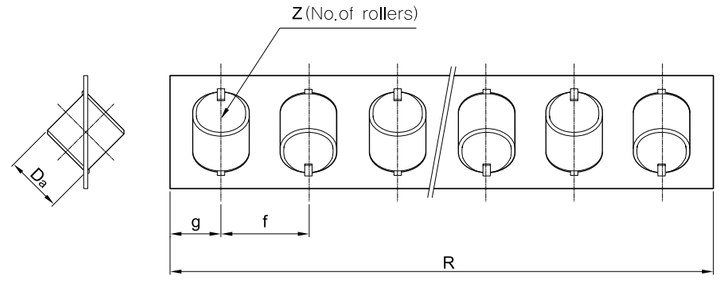
Cross Roller Guide SCVR Type

SCVR6 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR6-100x7Z	56	30	15	100	1x50	25	14.4	6	M6	5.2
SCVR6-150x10Z	96			150	2x50					
SCVR6-200x13Z	136			200	3x50					
SCVR6-250x17Z	156			250	4x50					
SCVR6-300x20Z	196			300	5x50					
SCVR6-350x24Z	216			350	6x50					
SCVR6-400x27Z	256			400	7x50					
SCVR6-450x31Z	276			450	8x50					
SCVR6-500x34Z	316			500	9x50					
SCVR6-550x38Z	336			550	10x50					
SCVR6-600x41Z	376			600	11x50					

Cross Roller Guide SCVR Type

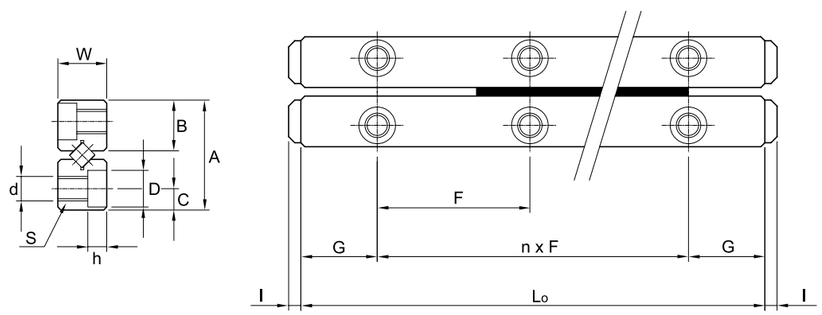


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
9.5	5.2	3.2	6	72	6	10	7	-0.007	1.91	1.76	1.5
				102			10				
				132			13				
				172			17				
				202			20				
				242			24				
				272			27				
				312			31				
				342			34				
				382			38				
				412			41				

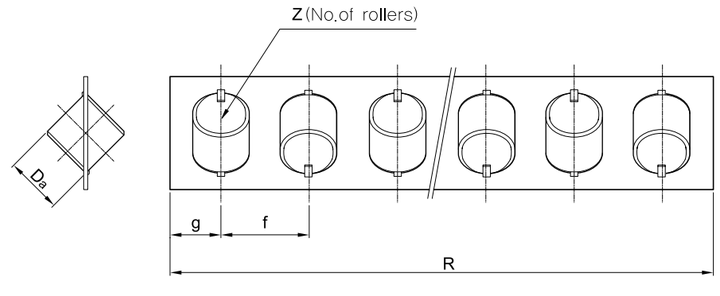
Cross Roller Guide SCVR Type

SCVR9 Type



Model No.	Max Stroke	Combined Dimensions			Assembled Dimensions					
		A	W	Lo	nxF	G	B	C	S	d
SCVR9-200x10Z	118	40	20	200	1x100	50	19.2	8	M8	6.8
SCVR9-300x15Z	178			300	2x100					
SCVR9-400x20Z	138			400	3x100					
SCVR9-500x25Z	298			500	4x100					
SCVR9-600x30Z	358			600	5x100					
SCVR9-700x35Z	418			700	6x100					
SCVR9-800x40Z	478			800	7x100					
SCVR9-900x45Z	538			900	8x100					
SCVR9-1000x50Z	598			1000	9x100					
SCVR9-1100x55Z	658			1100	10x100					
SCVR9-1200x60Z	718			1200	11x100					

Cross Roller Guide SCVR Type

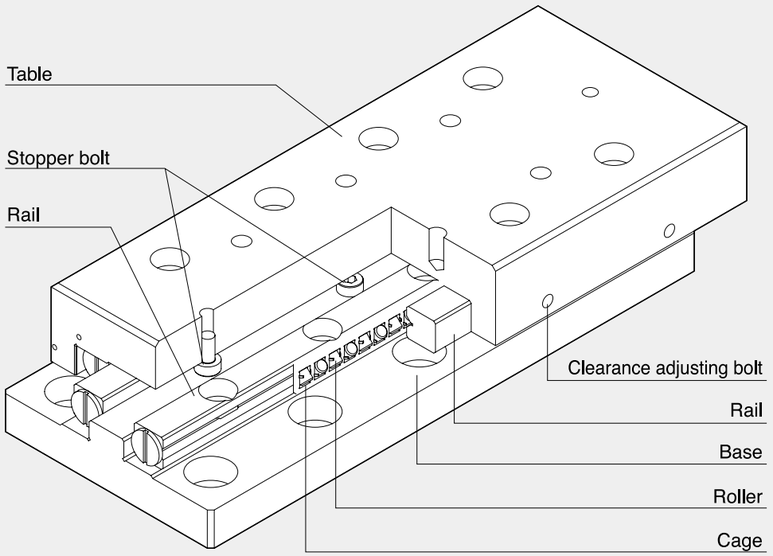


(Unit : mm)

Assembled Dimensions			Roller Cage Dimensions				No. of Rollers	Permissible Preload	Basic Load Rating (per roller)		Mass (Rail)
D	h	l	Da	R	g	f	Z		Cz[kN]	Coz[kN]	[Kg/m]
10.5	6.2	4	9	141	7.5	14	10	-0.010	4.31	4.36	3.2
				211			15				
				281			20				
				351			25				
				421			30				
				491			35				
				561			40				
				631			45				
				701			50				
				771			55				
				841			60				

Cross Roller Table SCVRT Type, SCVRU Type

CROSS ROLLER TABLE



The SBC cross roller table is a precision table assembled with SBC cross guides (SCVR type). Since there is minimal elastic deformation the table achieves high rigidity and stable linear motion. The tables can be used for OA equipment, Automation-assembly machines and Optical measurement devices.

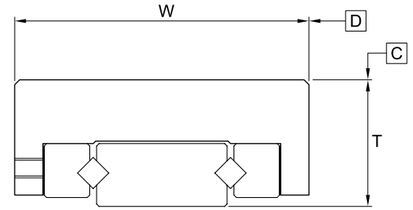
[Cross Roller Table Model Type]

- SCVRT Type : Miniature Type (Base Tapped-hole)
- SCVRT-A Type : Miniature Type (Base Mounting-hole)
- SCVRU Type

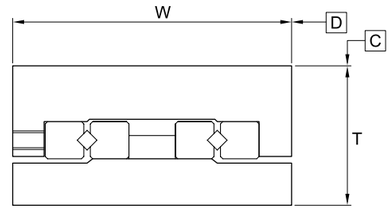
Cross Roller Table SCVRT Type, SCVRU Type

Accuracy

The running accuracy of a cross roller table is measured with dial indicators as shown in Figure below.
The tolerance of table height C and D are shown in the dimension tables.



(SCVRT, SCVRT-A Type)



(SCVRU Type)

Precautions

[Cross Roller Table Model Type]

When machining additional features into the Table and the Base of the Cross Roller Table, please observe the precautions below.

❶ Prevent cutting chips and foreign substance from entering the Cross Roller Guide.

❷ Design the mounting holes as blind holes, not penetrating (thru) holes. For additional machining, please contact SBC Linear.

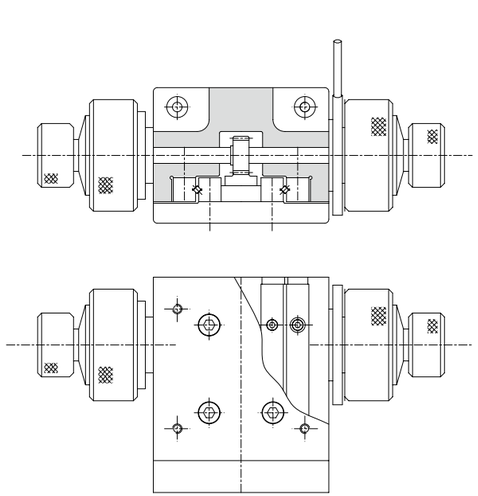
❹ The preload of the Cross Roller Table is fixed to the proper level. Please do not adjust the preload adjustment bolts.

[Cage Creep]

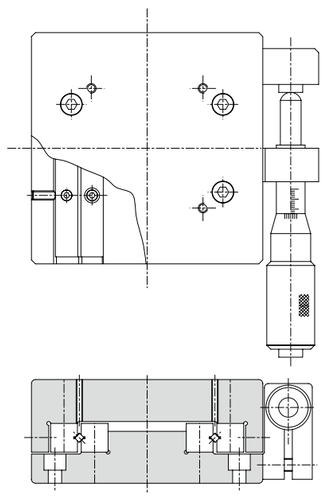
WheThe Roller Cage moves accurately but may be drift (cage creep) due to vibrations, inertia or impact. Please mount an external stop for the table to control the travel.

Cross Roller Table SCVRT Type, SCVRU Type

[Example]



(Rack & Pinion)



(Micro head)

Cross Roller Guide

Cross Roller Table SCVRT Type, SCVRU Type

Ordering Example

[SCVRT Miniature Type (Base Tapped-hole)]

SCVRT 2035 – **T** – **R**
[1] [2] [3]

[1] Model No. : SCVRT(Base Tapped-hole)
[2] Additional processing :No Symbol (Standard), T (Additional processing)
[3] Surface Treatment :No symbol (Standard), R (Surface Treatment)

[SCVRT-A Miniature Type (Base Mounting-hole)]

SCVRT 2035A – **T** – **R**
[1] [2] [3]

[1] Model No. : SCVRT-A (Base Mounting-hole)
[2] Additional processing :No Symbol (Standard), T (Additional processing)
[3] Surface Treatment :No symbol (Standard), R (Surface Treatment)

[SCVRU]

SCVRU 2035 – **T** – **R**
[1] [2] [3]

[1] Model No. : SCVRU
[2] Additional processing :No Symbol (Standard), T (Additional processing)
[3] Surface Treatment :No symbol (Standard), R (Surface Treatment)

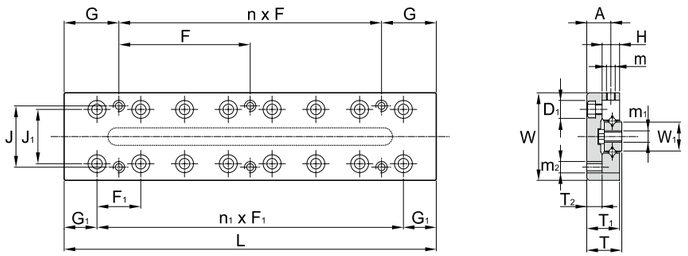
※ When ordering surface treatment, please include the symbol of the surface treatment.

❶ Standard , Black Chrome coating (Raydent treatment), Fluorocarbon resin coating, Hard Chrome plating

❷ Contact SBC for special surface treatments.

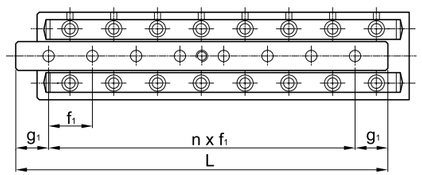
Cross Roller Table SCVRT Type

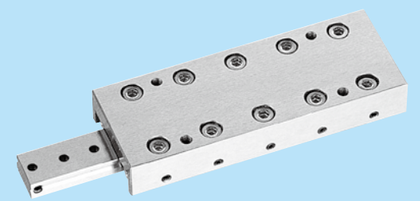
SCVRT1 Miniature Type (Base Tapped-hole)



Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 1025	12	20	8	25	23	14	1x18	3.5	M2.6	1x10	12.4	4.1	7.5
SCVRT 1035	18			35	32		1x28	3.5		2x10			
SCVRT 1045	25			45	42		1x20	12.5		3x10			
SCVRT 1055	32			55	52		1x30	12.5		4x10			
SCVRT 1065	40			65	62		2x20	12.5		5x10			
SCVRT 1075	45			75	72		1x30	22.5		6x10			
SCVRT 1085	50			85	82		2x30	12.5		7x10			

Cross Roller Table SCVRT Type

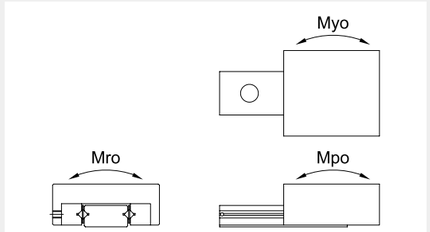




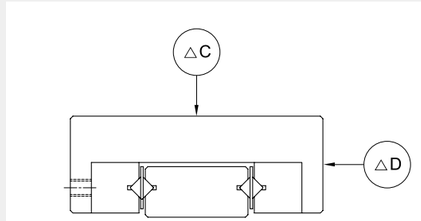
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position			No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	nxf1	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
7.5	3.5	4	6.7	5.5	M2	M2.6	2x7.5	5	5	0.28	0.27	0.75	0.46	0.69	2	4
							2x10	7.5	7	0.38	0.41	1.23	0.85	1.03		
							3x10		10	0.56	0.69	2.18	1.67	1.72		5
							4x10		12	0.65	0.82	2.97	2.35	2.06		
							5x10		14	0.73	0.96	3.87	3.17	2.40		
							6x10		18	0.87	1.27	6.05	5.16	3.19		
							7x10		20	0.94	1.37	7.32	6.37	3.43		

* Static permissible moment

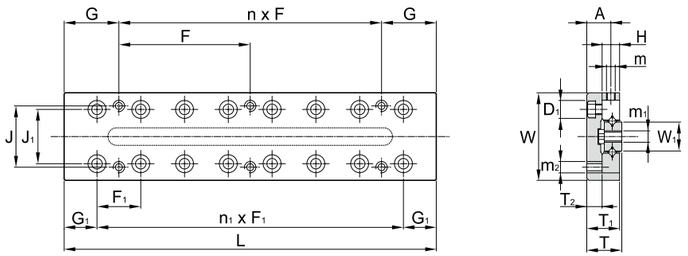


* Accuracy



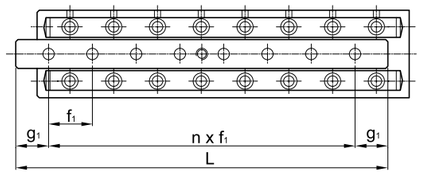
Cross Roller Table SCVRT Type

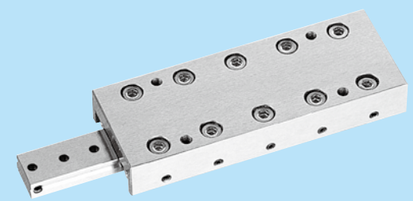
SCVRT2 Miniature Type (Base Tapped-hole)



Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 2035	18	30	12	35	78	22	1x28	3.5	M3	1x15	20	6	10
SCVRT 2050	30			50	113		1x43	3.5		2x15			
SCVRT 2065	40			65	147		1x30	17.5		3x15			
SCVRT 2080	50			80	184		1x45	17.5		4x15			
SCVRT 2095	60			95	220		2x30	17.5		5x15			
SCVRT 2110	70			110	257		1x45	32.5		6x15			
SCVRT 2125	80			125	290		2x45	17.5		7x15			

Cross Roller Table SCVRT Type

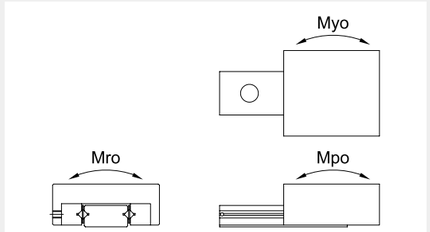




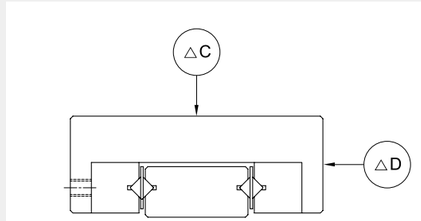
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position			No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	nxf1	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
11.5	5.5	6	12.2	8.5	M2	M3	1x20	7.5	5	0.51	0.51	2.29	1.37	2.21	2	4
							2x15	10	7	0.69	0.76	3.76	2.65	3.32		
							3x15		9	0.85	0.98	5.62	4.22	4.25		5
							4x15		12	0.98	1.27	9.10	7.26	5.52		
							5x15		14	1.18	1.57	11.8	9.71	6.80		
							6x15		17	1.47	2.06	16.7	14.1	8.93		
							7x15		19	1.57	2.25	20.4	17.5	9.77		

* Static permissible moment

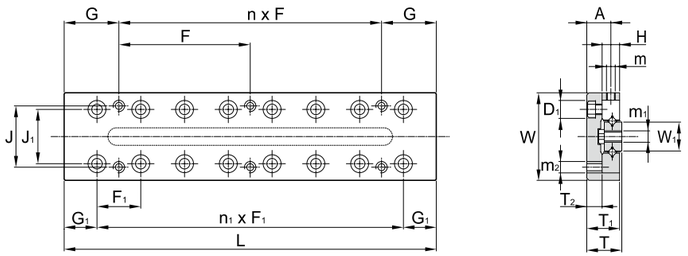


* Accuracy



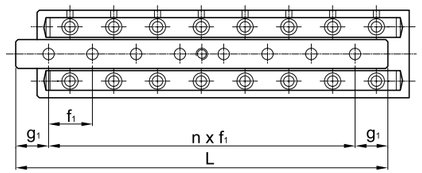
Cross Roller Table SCVRT Type

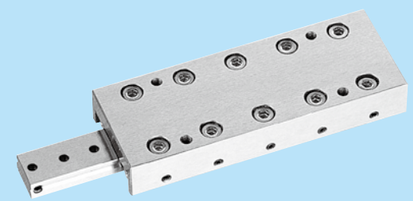
SCVRT3 Miniature Type (Base Tapped-hole)



Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 3055	30	40	16	55	229	30	1x40	7.5	M4	1x25	28.4	7.5	15
SCVRT 3080	45			80	336		1x65	7.5		2x25			
SCVRT 3105	60			105	442		1x50	27.5		3x25			
SCVRT 3130	75			130	551		1x75	27.5		4x25			
SCVRT 3155	90			155	657		2x50	27.5		5x25			
SCVRT 3180	105			180	766		1x75	52.5		6x25			
SCVRT 3205	130			205	871		2x75	27.5		7x25			

Cross Roller Table SCVRT Type

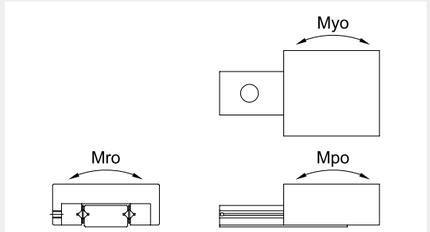




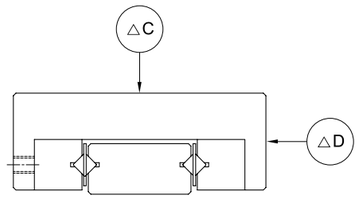
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position			No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	nxf1	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
15.5	7.5	8	16	11.5	M2	M4	1x35	10	6	1.27	1.37	9.85	6.57	7.97	2	5
							2x35	15	10	2.16	2.84	22.2	17	16.5		
							3x25		13	2.94	4.22	34.8	28.1	24.4	5	6
							4x25		17	3.63	5.69	55.8	47.1	33.3		
							5x25		20	3.92	6.37	74.7	64.6	36.9		
							6x25		24	4.02	6.57	104	92.3	38.1		
							7x25		26	4.22	7.16	120	107	41.5		

* Static permissible moment

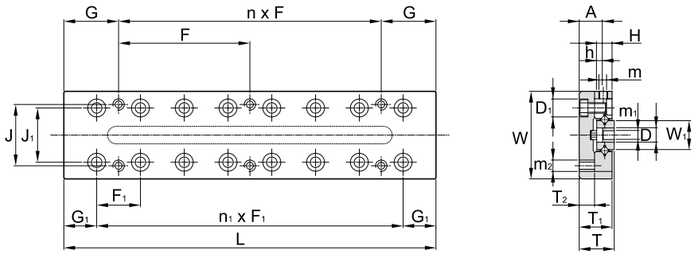


* Accuracy



Cross Roller Table SCVRT Type

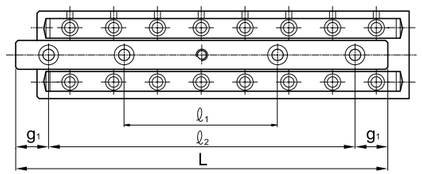
SCVRT1-A Miniature Type (Base Mounting-hole)

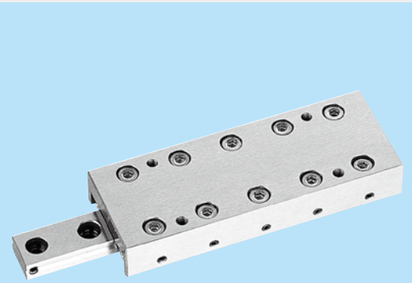


Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 1025A	12	20	8	25	23	14	1x18	3.5	M2.6	1x10	12.4	4.1	7.5
SCVRT 1035A	18			35	32		1x28	3.5		2x10			
SCVRT 1045A	25			45	42		1x20	12.5		3x10			
SCVRT 1055A	32			55	52		1x30	12.5		4x10			
SCVRT 1065A	40			65	62		2x20	12.5		5x10			
SCVRT 1075A	45			75	72		1x30	22.5		6x10			
SCVRT 1085A	50			85	82		2x30	12.5		7x10			

Cross Roller Guide

Cross Roller Table SCVRT Type

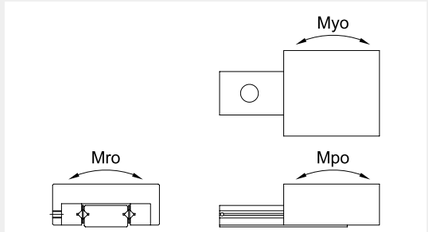




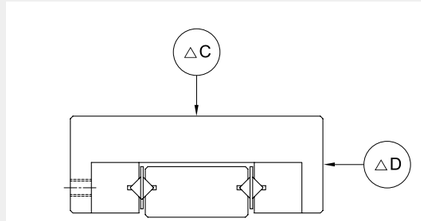
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position						No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	D	h	ℓ1	ℓ2	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
7.5	3.5	4	6.7	5.5	M2	2.5	4.1	2.2	-	18	3.5	5	0.28	0.27	0.75	0.46	0.69	2	4
									-	25	5	7	0.38	0.41	1.23	0.85	1.03		
									25	38	3.5	10	0.56	0.69	2.18	1.67	1.72		5
									29	48	3.5	12	0.65	0.82	2.97	2.35	2.06		
									31	55	5	14	0.73	0.96	3.87	3.17	2.40		
									35	65	5	18	0.87	1.27	6.05	5.16	3.19		
									40	75	5	20	0.94	1.37	7.32	6.37	3.43		

* Static permissible moment

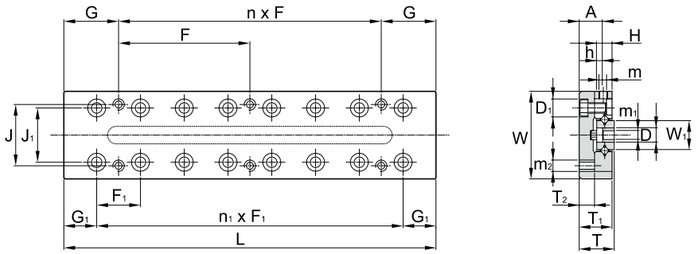


* Accuracy

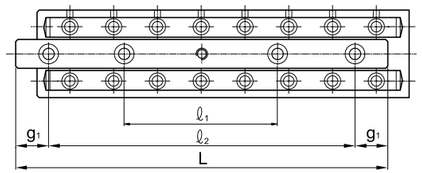


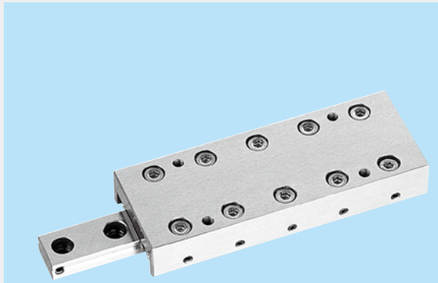
Cross Roller Table SCVRT Type

SCVRT2-A Miniature Type (Base Mounting-hole)



Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 2035A	18	30	12	35	78	22	1x28	3.5	M3	1x15	20	6	10
SCVRT 2050A	30			50	113		1x43	3.5		2x15			
SCVRT 2065A	40			65	147		1x30	17.5		3x15			
SCVRT 2080A	50			80	184		1x45	17.5		4x15			
SCVRT 2095A	60			95	220		2x30	17.5		5x15			
SCVRT 2110A	70			110	257		1x45	32.5		6x15			
SCVRT 2125A	80			125	290		2x45	17.5		7x15			

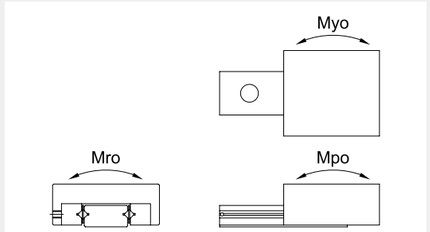




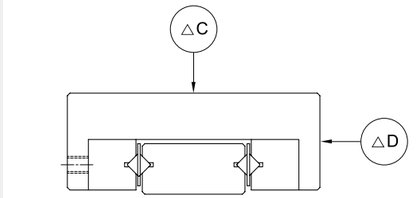
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position					No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	D	h	ℓ1	ℓ2	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
11.5	5.5	6	12.2	8.5	M2	3.5	6	3.2	-	25	5	5	0.51	0.51	2.29	1.37	2.21	2	4
									-	35	7.5	7	0.69	0.76	3.76	2.65	3.32		
									33	55	5	9	0.85	0.98	5.62	4.22	4.25		5
									40	70	5	12	0.98	1.27	9.10	7.26	5.52		
									45	85	5	14	1.18	1.57	11.8	9.71	6.80		
									50	95	7.5	17	1.47	2.06	16.7	14.1	8.93		
									55	110	7.5	19	1.57	2.25	20.4	17.5	9.77		

* Static permissible moment

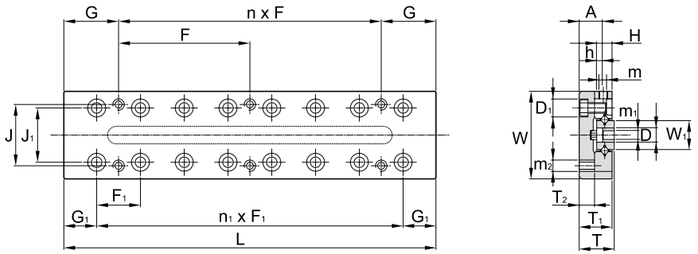


* Accuracy



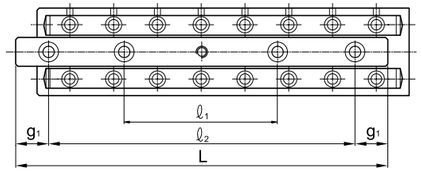
Cross Roller Table SCVRT Type

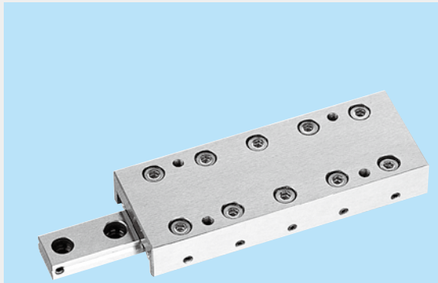
SCVRT3-A Miniature Type (Base Mounting-hole)



Model No.	Max Stroke	Major Dimensions				Top Dimensions							
		W±0.1	T±0.1	L	Mass [g]	J	nxF	G	m2	n1xF1	J1	D1	G1
SCVRT 3055A	30	40	16	55	229	30	1x40	7.5	M4	1x25	28.4	7.5	15
SCVRT 3080A	45			80	336		1x65	7.5		2x25			
SCVRT 3105A	60			105	442		1x50	27.5		3x25			
SCVRT 3130A	75			130	551		1x75	27.5		4x25			
SCVRT 3155A	90			155	657		2x50	27.5		5x25			
SCVRT 3180A	105			180	766		1x75	52.5		6x25			
SCVRT 3205A	130			205	871		2x75	27.5		7x25			

Cross Roller Table SCVRT Type

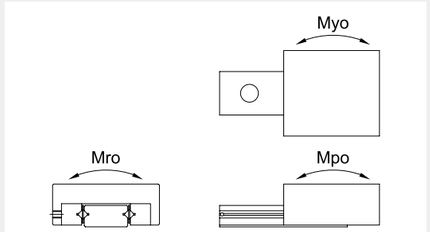




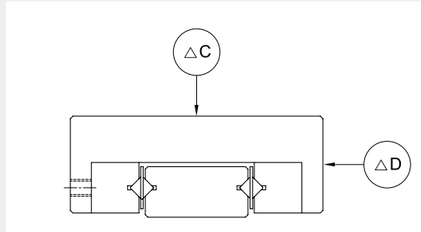
(Unit : mm)

End Dimensions						Base Dimensions mounting-hole position					No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
T1	T2	H	W1	A	m	m1	D	h	ℓ1	ℓ2	g1	Z	C	Co	Mpo	Myo	Mro	△C	△D
15.5	7.5	8	16	11.5	M2	4.5	7.5	4.2	-	40	7.5	6	1.27	1.37	9.85	6.57	7.97	2	6
									43	68	6	10	2.16	2.84	22.2	17	16.5		
									55	90	7.5	13	2.94	4.22	34.8	28.1	24.4	3	6
									65	115	7.5	17	3.63	5.69	55.8	47.1	33.3		
									95	140	7.5	20	3.92	6.37	74.7	64.6	36.9		
									85	165	7.5	24	4.02	6.57	104	92.3	38.1		
									90	190	7.5	26	4.22	7.16	120	107	41.5		

* Static permissible moment

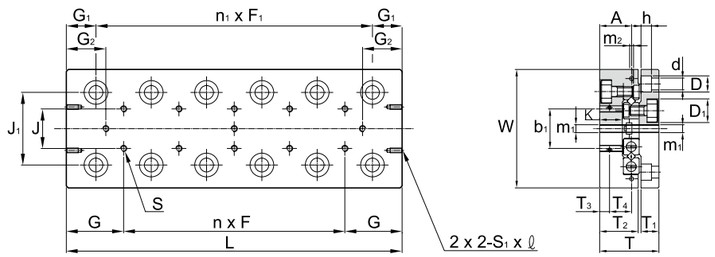


* Accuracy



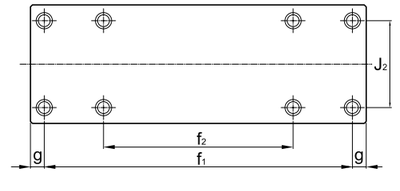
Cross Roller Table SCVRU Type

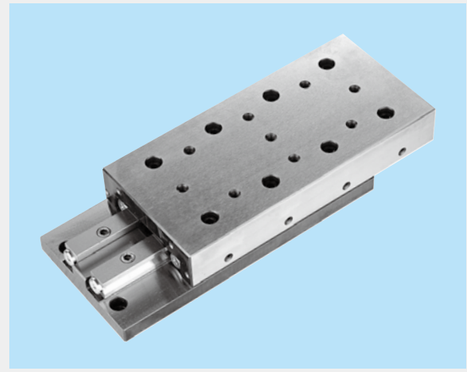
SCVRU1 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions												
		W -0.2 -0.4	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	T3	S1xℓ	T2	T1
SCVRU 1025	12	30	17	25	0.08	10	-	12.5	M2	18.4	-	7.5	2.5	12	2.5	M2x4	11	5.5
SCVRU 1035	18			35	0.11		1x10				1x10		4.5					
SCVRU 1045	25			45	0.15		2x10				2x10		6					
SCVRU 1055	32			55	0.18		3x10				3x10		7.5					
SCVRU 1065	40			65	0.21		4x10				4x10		8.5					
SCVRU 1075	45			75	0.24		5x10				5x10		11					
SCVRU 1085	50			85	0.27		6x10				6x10		13.5					

Cross Roller Table SCVRU Type

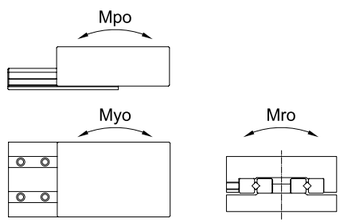




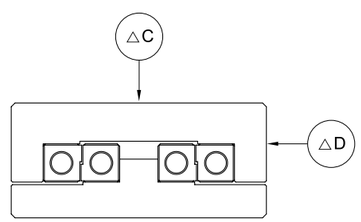
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position			No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
6.5	2.55	4.1	2.5	4.1	M2	9	M2	22	18	-	3.5	5	0.28	0.27	0.75	0.46	1.24	2	4
									28	-		7	0.38	0.41	1.23	0.85	1.85		
									38	-		10	0.56	0.69	2.18	1.67	3.09		
									48	28		12	0.65	0.82	2.97	2.35	3.71		5
									58	38		14	0.73	0.96	3.87	3.17	4.33		
									68	48		18	0.87	1.27	6.05	5.16	5.74		
									78	58		20	0.94	1.37	7.32	6.34	6.18		

* Static permissible moment

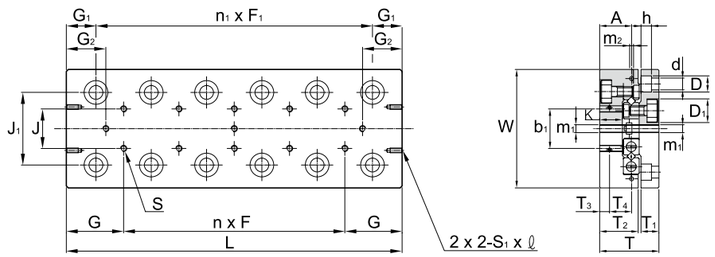


* Accuracy



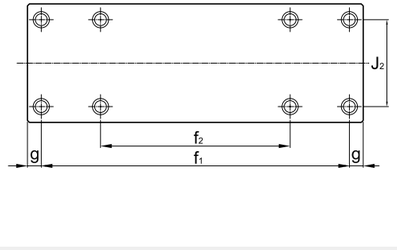
Cross Roller Table SCVRU Type

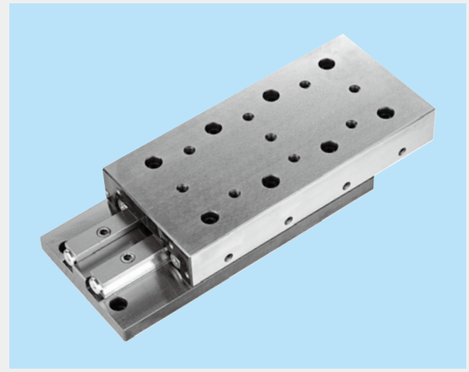
SCVRU2 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions												
		W -0.2 -0.4	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	T3	S1xℓ	T2	T1
SCVRU 2035	18	40	21	35	0.2	15	-	17.5	M3	25	1x15	10	3	16	3.4	M2x4	14	6.5
SCVRU 2050	30			50	0.26		1x15				2x15		4.5					
SCVRU 2065	40			65	0.34		2x15				3x15		7					
SCVRU 2080	50			80	0.42		3x15				4x15		9.5					
SCVRU 2095	60			95	0.5		4x15				5x15		12					
SCVRU 2110	70			110	0.58		5x15				6x15		14.5					
SCVRU 2125	80			125	0.66		6x15				7x15		17					

Cross Roller Table SCVRU Type

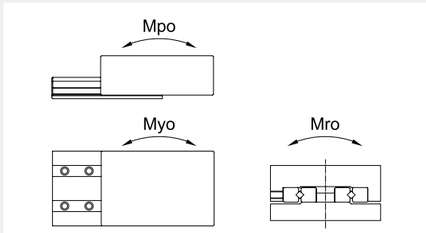




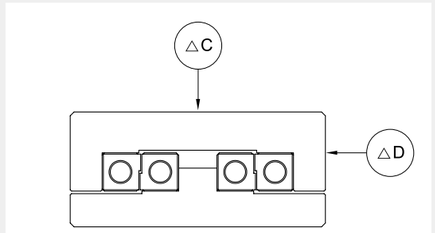
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position				No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
7.5	3.5	6	3.5	6	M3	11	M3	30	25	-	5	5	0.51	0.51	2.29	1.4	3.06	2	4
									40	-		7	0.69	0.76	3.76	2.6	4.59		
									55	-		9	0.85	0.98	5.62	4.17	5.89		5
									70	40	5	12	1.18	1.57	9.1	7.22	9.42		
									85	55		14	1.27	1.76	11.8	9.7	10.5		
									100	70		17	1.47	2.06	16.7	14.1	12.3	3	6
									115	85		19	1.57	2.25	20.4	17.5	13.5		

* Static permissible moment

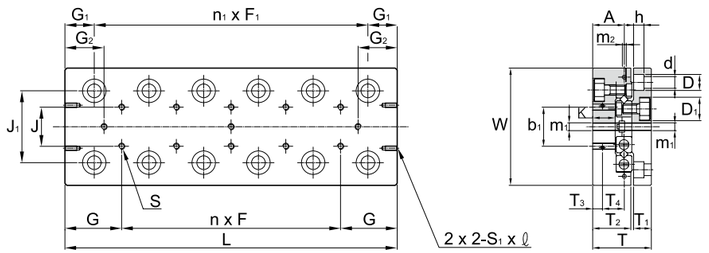


* Accuracy



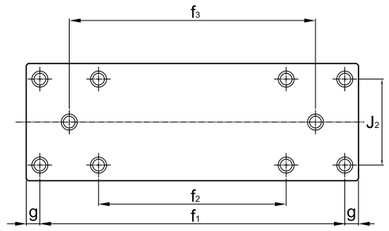
Cross Roller Table SCVRU Type

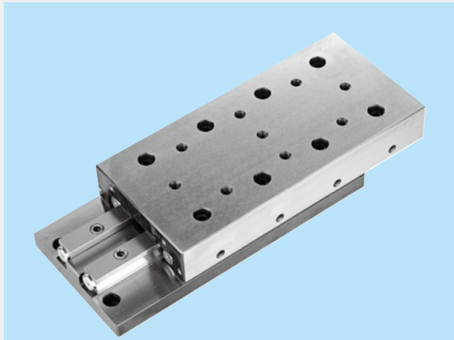
SCVRU3 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions												
		W ±0.1	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	T3	S1xℓ	T2	T1
SCVRU 3055	30	60	28	55	0.57	25	-	27.5	M4	39	1x25	15	5.5	40	5.5	M3x6	18.5	9
SCVRU 3080	45			80	0.80		1x25				2x25		10.5					
SCVRU 3105	60			105	1.03		2x25				3x25		15.5					
SCVRU 3130	75			130	1.26		3x25				4x25		20.5					
SCVRU 3155	90			155	1.49		4x25				5x25		25.5					
SCVRU 3180	105			180	1.72		5x25				6x25		30.5					
SCVRU 3205	130			205	1.95		6x25				7x25		30.5					

Cross Roller Table SCVRU Type

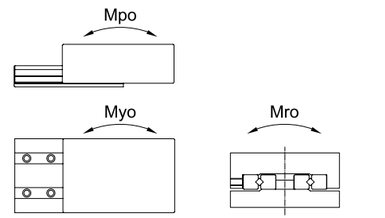




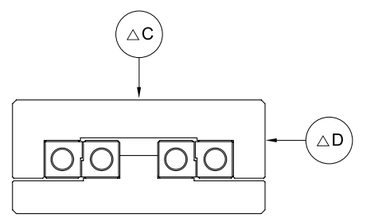
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position				No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	f3	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
10	4.5	7.5	5	7.5	M4	14.5	M4	40	3	-	-	10	6	1.27	1.67	9.85	6.54	15.5	2	5
									60	-	-		10	1.47	2.75	22.2	17	25.6		
									85	-	-		13	2.06	3.33	34.8	28.1	31.1	3	6
									110	-	-		17	2.35	4.41	55.8	47.1	41.2		
									135	-	85		20	2.94	5.49	74.7	64.6	51.2		7
									160	-	110		24	3.53	6.57	104	92.3	61.3		
									185	85	135		26	4.02	7.16	120	107	66.8		

* Static permissible moment

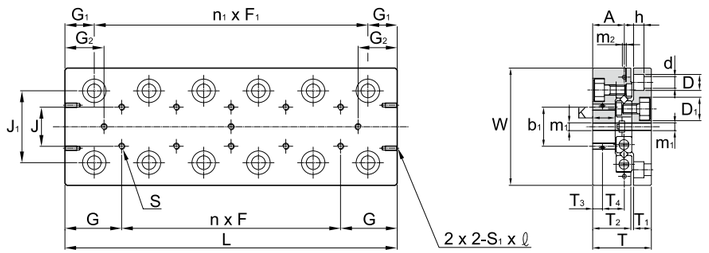


* Accuracy



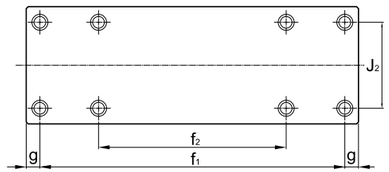
Cross Roller Table SCVRU Type

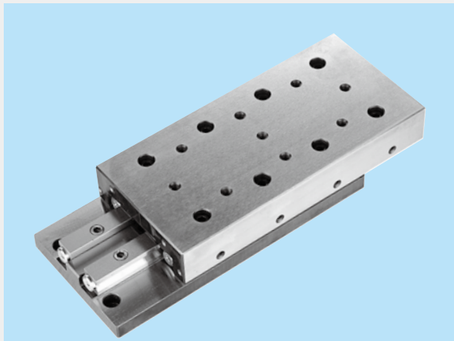
SCVRU4 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions														
		W ±0.1	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	b2	T3	T4	S1xℓ	T2	T1
SCVRU 4085	50	80	35	85	1.5	40	-	42.5	M5	53	1x40	22.5	10.5	55		6.5		M3x6	24	10.5
SCVRU 4125	75			125	2.3		1x40				2x40		18							
SCVRU 4165	105			165	3.1		2x40				3x40		23							
SCVRU 4205	135			205	3.8		3x40				4x40		30.5							
SCVRU 4245	155			245	4.6		4x40				5x40		38							
SCVRU 4285	185			285	5.3		5x40				6x40		43							

Cross Roller Table SCVRU Type

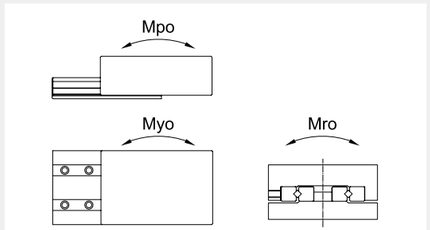




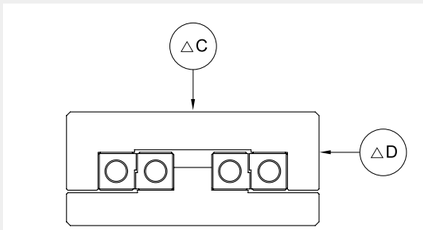
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position				No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
12.5	5.5	9.5	6	9.5	M4	18.5	M4	60	65	-	10	7	3.53	4.8	48.7	33.7	64	2	5
									80	-	22.5	11	5.2	8.04	101	79.1	107	3	6
									120	-		14	6.77	11.3	153	125	150		7
									160	80		18	8.14	14.5	239	204	193		
									200	120		22	9.42	17.7	344	302	235		
									240	160		26	10.7	20.9	468	418	278		

* Static permissible moment

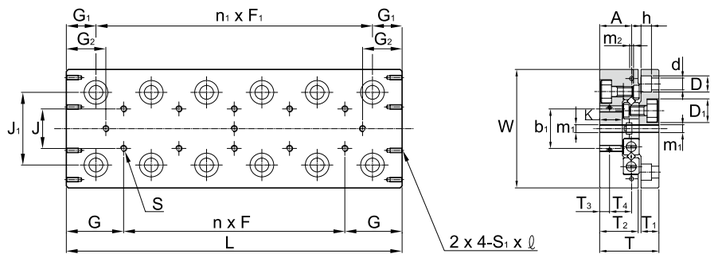


* Accuracy

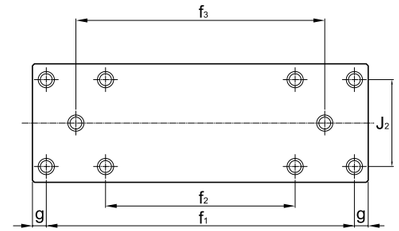


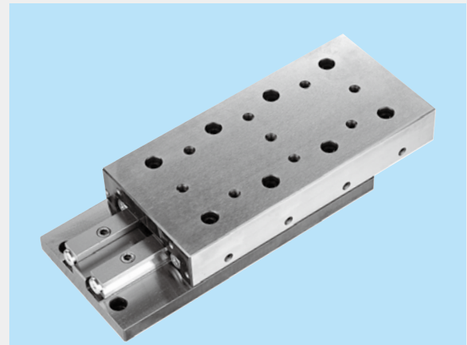
Cross Roller Table SCVRU Type

SCVRU6 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions														
		W ±0.1	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	b2	T3	T4	S1xℓ	T2	T1
SCVRU 6110	60	100	45	11	3.2	50	-	55	M6	63	1x50	30	16	60	92	8	15	M4x8	31	13
SCVRU 6160	95			160	4.6		1x50				2x50		23.5							
SCVRU 6210	130			210	6		2x50				3x50		31							
SCVRU 6260	165			260	7.4		3x50				4x50		38.5							
SCVRU 6310	200			310	8.7		4x50				5x50		46							
SCVRU 6360	235			360	10.1		5x50				6x50		53.5							
SCVRU 6410	265			410	11.5		6x50				7x50		63.5							

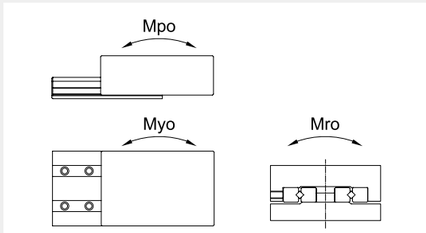




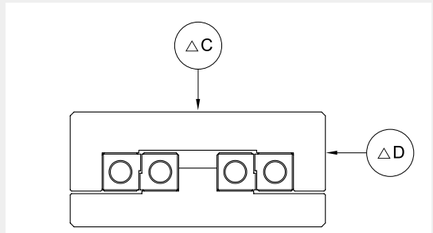
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position				No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	f3	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
15	7	11	7	11	M5	23.5	M5	60	90	-	-	10	9	7.45	10.6	121	80.5	158	3	6
									140	-	-		9	9.31	14.1	231	171	211		
									190	-	90		13	12.5	21.1	428	345	317		7
									240	-	140		16	15.6	28.2	616	516	423		
									290	-	190		19	17.1	31.8	838	720	476	4	8
									340	140	240		22	19.8	38.8	1090	958	582		
									390	190	290		26	22.5	45.9	1480	1320	688		

* Static permissible moment

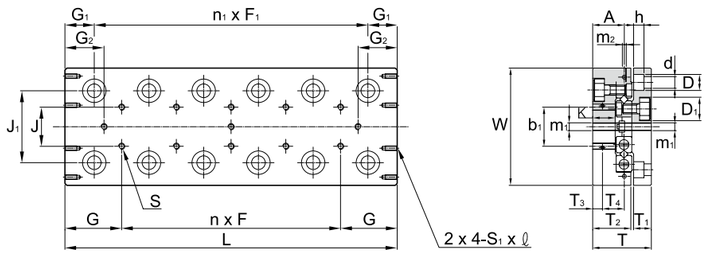


* Accuracy



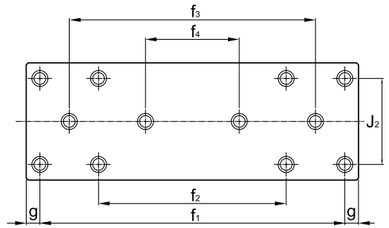
Cross Roller Table SCVRU Type

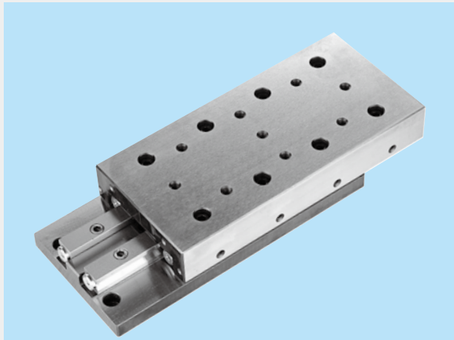
SCVRU9 Type



Model No.	Max Stroke	Major Dimensions				Top Dimensions														
		W ±0.1	T ±0.1	L	Mass [kg]	J	nxF	G	S	J1	n1xF1	G1	G2	b1	b2	T3	T4	S1xℓ	T2	T1
SCVRU 9210	130	145	60	210	12	85	-	105	M8	96	1x100	55	27	90	135	11	20	M4X8	43	16
SCVRU 9310	180			310	17.6		1x100				2x100		52							
SCVRU 9410	350			410	23.2		2x100				3x100									
SCVRU 9510	450			510	28.8		3x100				4x100									
SCVRU 9610	550			610	34.4		4x100				5x100		17							
SCVRU 9710	650			710	40		5x100				6x100									
SCVRU 9810	750			810	45.6		6x100				7x100									

Cross Roller Table SCVRU Type

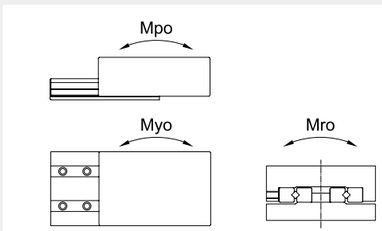




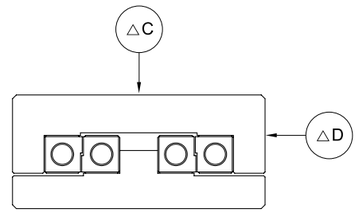
(Unit : mm)

End Dimensions								Base Dimensions mounting-hole position						No. of Rollers	Basic load rating [kN]		Static permissible moment [N.m]			Accuracy [㎛]	
K	d	D	h	D1	m1	A	m2	J2	f1	f2	f3	f4	g	Z	C	Co	Mpo	Myo	Mro	△C	△D
21	9	14	9	14	M8	32	M6	90	100	-	-	-	55	9	20.9	34.9	837	622	838	3	7
									200	-	-	-		14	31.9	61.1	1760	1440	1460		
									300	-	100	-		15	31.9	61.1	1990	1650	1460	4	8
									400	-	200	-		19	38.4	78.5	3030	2600	1880		
									500	100	300	-		22	44.7	96	3950	3460	2300		9
									600	200	400	-		26	50.6	114	5380	4810	2730		
									700	300	500	100		29	53.5	123	6600	5960	2940	5	10

* Static permissible moment



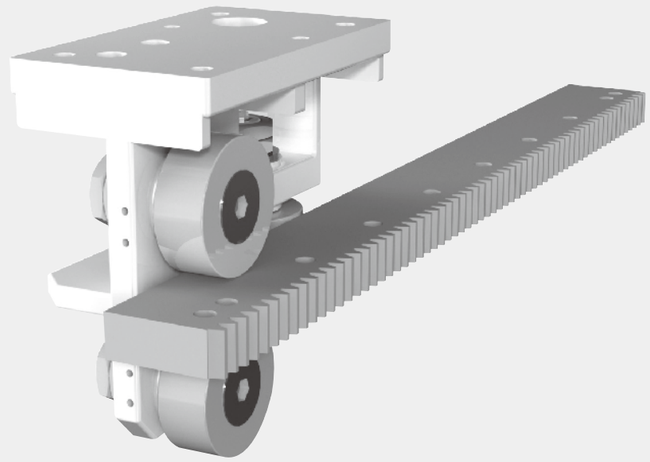
* Accuracy



Robot Carrier Guide

Technical Data / Carriage (3 rollers) / Carriage (5 rollers) / Carriage Option /
Flat Rail / Rack Rail

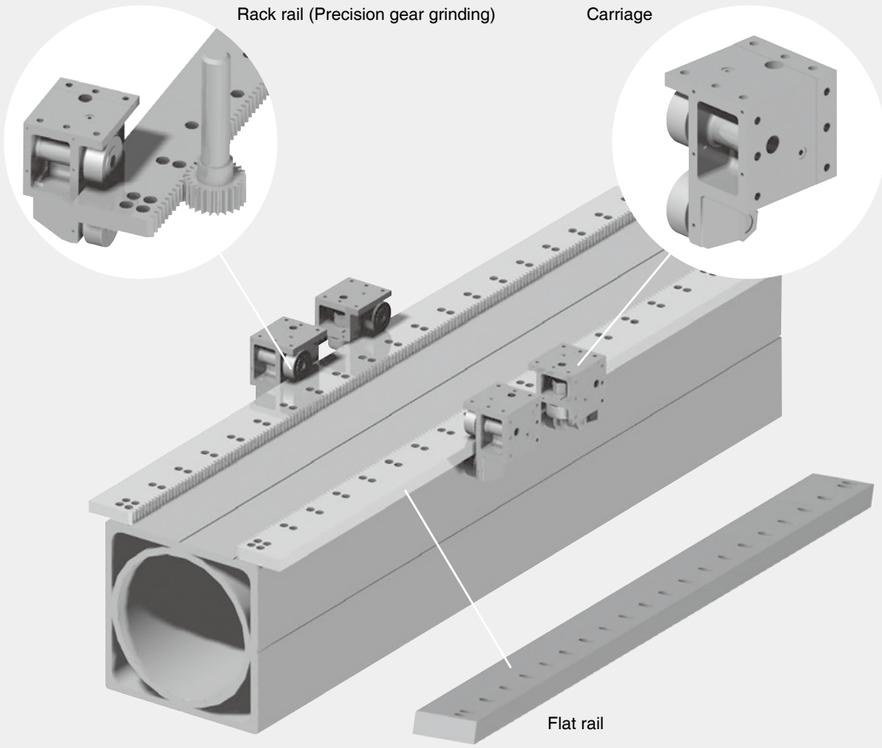
SBC Robot Carrier Guide Introduction



SBC Robot Carrier Guide System uses a flat rack rail that easily mounts to guide and drive system. Our exclusive 3 cam roller carriage design allows for high load and accuracy at high travel speeds.

Rack rail and pinion assembly

[Product overview]



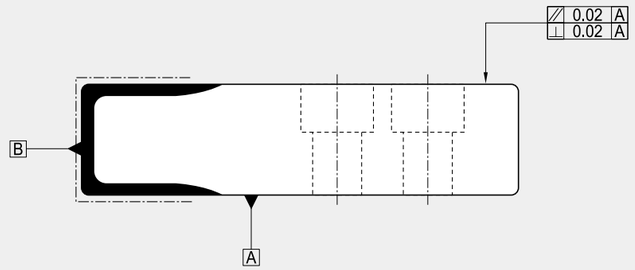
[For example application]

The drive system for robot carrier can be easily consisted with combination of rack rail, carrier pinion and linear guide.

Accuracy

Our guide curacy of guide rail in guide system is a key factor which affects the traveling performance of roller block and basically accuracy.

The precisely grounded guide rail system of raceway with hardness HrC58~62 achieves durability



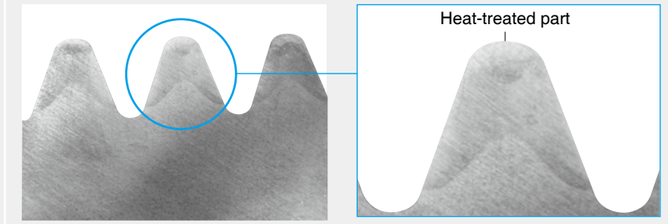
Pinions and Racks Accuracy

	HrC	fp [mm]	Fp [mm]	P [mm]
Pinion	58~62	0.006	-	-
Rack	56~60	0.008	0.08	0.03

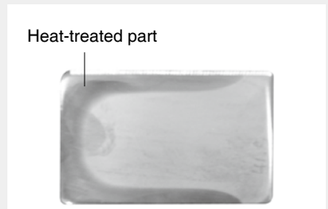
- fp : Adjacent pitch error
- Fp/1000mm : Cumulative pitch error
- P : Pitch tolerance of cut

Hardness and durability test

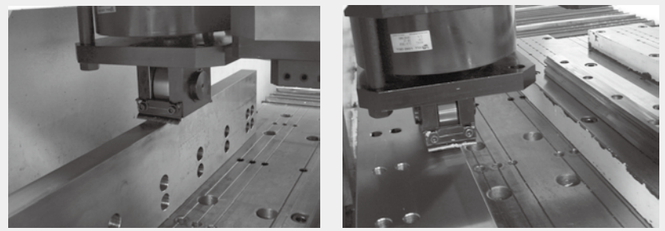
[Fig1. Hardness pattern for tooth profile]



[Fig2. Hardness pattern for flat rail]



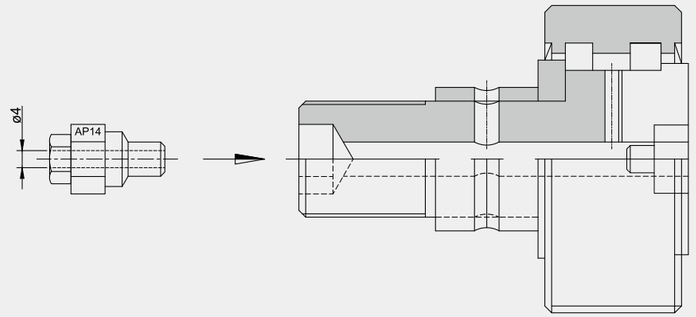
[Fig3. Durability test]



Technical Data

Lubrication

It is important to select the appropriatelubricant,distribution method and Interval to assure long, trouble-free operating life.

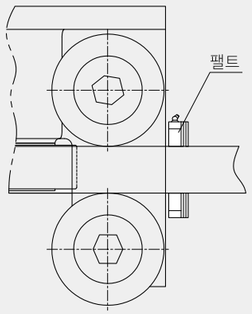


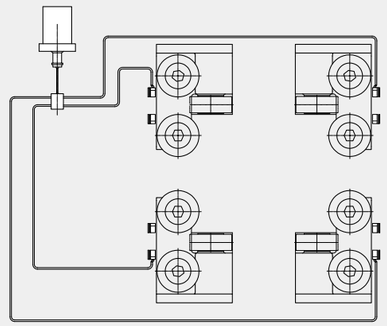
[Cam Roller Lubrication Interval]

We recommend lubricating every 10,000 Km of travel,however several factors affect this interval. Please consult factory with your specific application.

[Rack &Pinion Lubrication]

We recommend using an automatic lubrication system to keep the rack and pinion properly lubricated.

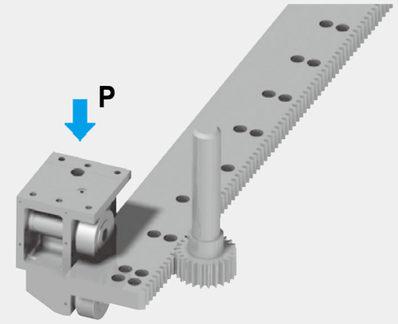




Technical Data

Calculation of Life time

Use max operating load when calculating roller life.



$$P = m \cdot g$$

$$Pw = f \cdot P$$

$$L = K_r \cdot \left(\frac{Cw}{Pw}\right)^{\frac{10}{3}} X\ 10^5$$

Load coefficient : (fw)

- P (N) : Maximum load
- m (kg) : mass
- g (m/s²) : gravity
- Pw (N) : Calculated load
- f (-) : Load coefficient
- L(hours) : Life
- Kr (-) : Size coefficient
- C (N) : Basic dynamic load rating

Vibration / Impact	fw
Slight	1.0 ~ 1.2
Moderate	1.2 ~ 1.5
Strong	1.5 ~ 2.5

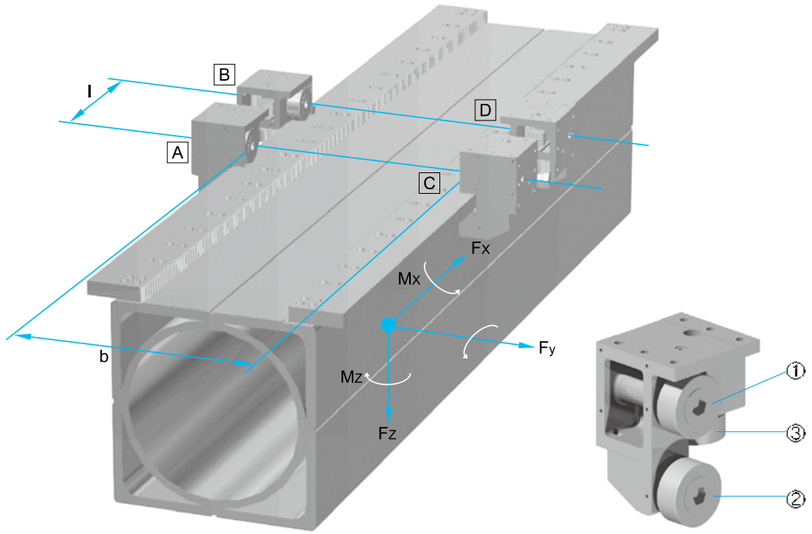
Static safety coefficient : (fs)

Static safety factor is calculated as using the static max load.This value must be bigger than 1.0 after dividing static max load by basic static load.

- fs (-) : Static safety coefficient
- Co (N) : Basic static load rating
- Pw (N) : Calculated load

$$fs = 0.7\ X\ \frac{Co}{Pw} \quad 0.7 > 1.0$$

Calculating the applied load



[Load of roller No.1 and No.2]

If the result is positive, roller No.1 has a radial load.

If the result is negative, roller No.2 has a radial load.

$$P_{A1;B2} = F_Z \cdot \left(\frac{1}{2} - \frac{a_y}{b}\right)\left(\frac{1}{2} - \frac{a_x}{l}\right) + \frac{F_x}{2} \cdot \frac{a_z}{l} + \frac{F_y}{2} \cdot \frac{a_z}{b} \quad (kN)$$

$$P_{B1;B2} = F_Z \cdot \left(\frac{1}{2} - \frac{a_y}{b}\right)\left(\frac{1}{2} - \frac{a_x}{l}\right) + \frac{F_x}{2} \cdot \frac{a_z}{l} + \frac{F_y}{2} \cdot \frac{a_z}{b} \quad (kN)$$

$$P_{C1;C2} = F_Z \cdot \left(\frac{1}{2} - \frac{a_y}{b}\right)\left(\frac{1}{2} - \frac{a_x}{l}\right) + \frac{F_x}{2} \cdot \frac{a_z}{l} + \frac{F_y}{2} \cdot \frac{a_z}{b} \quad (kN)$$

$$P_{D1;D2} = F_Z \cdot \left(\frac{1}{2} - \frac{a_y}{b}\right)\left(\frac{1}{2} - \frac{a_x}{l}\right) + \frac{F_x}{2} \cdot \frac{a_z}{l} + \frac{F_y}{2} \cdot \frac{a_z}{b} \quad (kN)$$

[Load of roller No.3]

If the result is positive, roller A3 and B3 has a radial load.

$$P_{A3;C3} = F_y \cdot \left(\frac{1}{2} - \frac{a_x}{l}\right) + F_x \cdot \frac{a_y}{l} \quad (kN)$$

If the result is negative, roller C3 and D3 has a radial load.

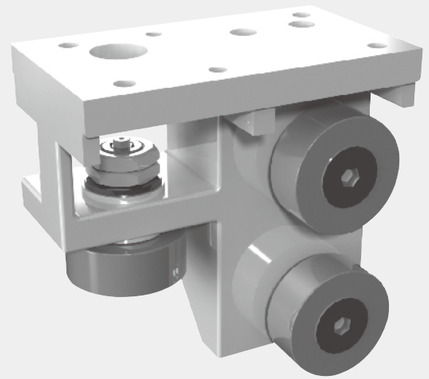
$$P_{B3;D3} = F_y \cdot \left(\frac{1}{2} + \frac{a_x}{l}\right) + F_x \cdot \frac{a_y}{l} \quad (kN)$$

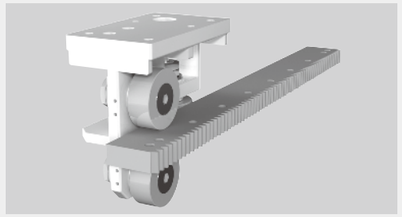
Technical Data

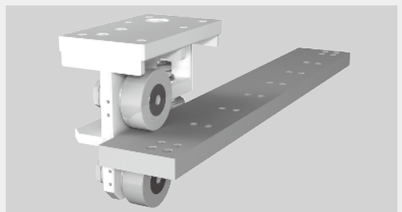
The carriage consists and feature

The carriage consists of 3 Stud roller(903X) and 5 Stud roller (905X).
Proper adjustment with BR Bearing and ER Bearing allows high speed with high load.

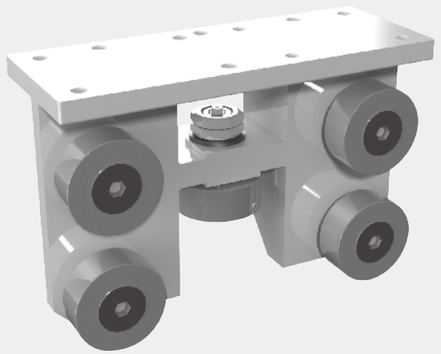
[Example for 903x carriage]

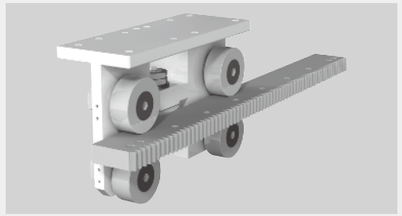


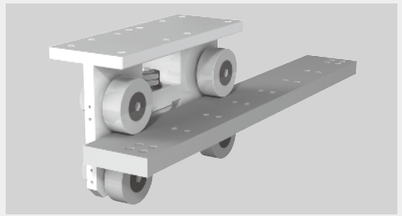




[Example for 905x carriage]

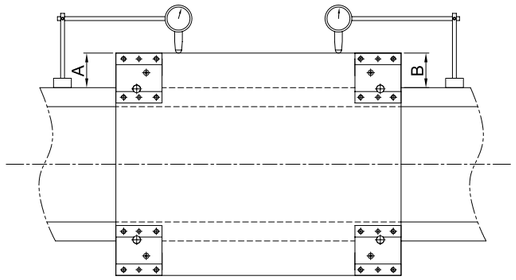






Technical Data

Example for installing robot carrier guide system

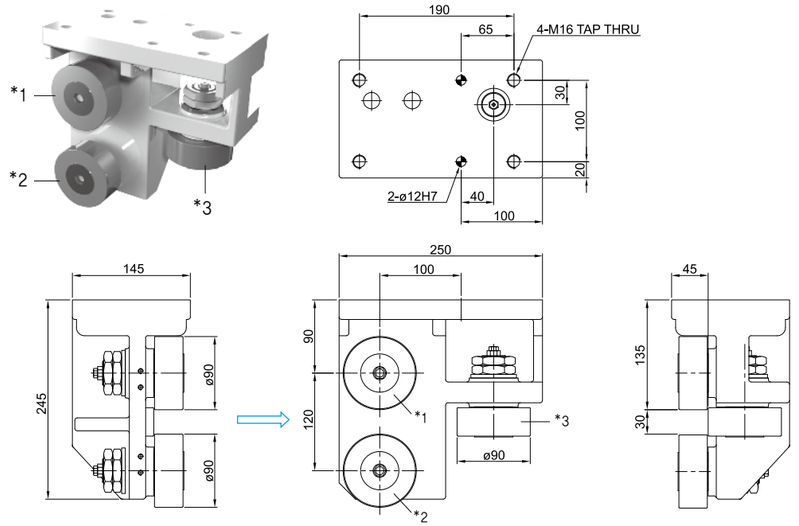


[Drive line configuration]

Ⅰ. After setting ①and④as “0” and assemble ②, ③, ⑤, ⑥.
Ⅱ. Adjust eccentricity of ②, ⑤ and fix them with nut.
Ⅲ. Make A and B be the same,before fixing Roller ③and adjust the back lash of Rack and Pinion to “0 ”
Ⅳ. Adjust eccentricity of gear back lash to “0.1mm” and fix the Roller . ③
Ⅴ. Adjust eccentricity of the Roller ⑥ and fix it with nut.
Ⅵ. Check up Rolling performance and readjust the Roller ②, ⑤, ⑥ and then finally fix them with nut.

Carriage (3 rollers)

903X Carriage (3 rollers)



(Unit : mm)

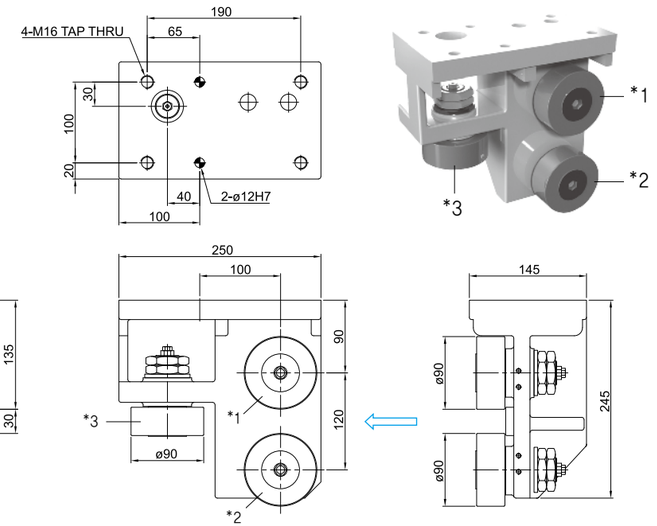
Type	*1	*2	*3	Kr	Co (kN)	C1 (kN)	C2 (kN)	Nmax(min-1)
9031R	BR	ER	ER	2.827	82	43.1	10.8	1800
9032R	BR	ER	BR					
9033R	ER	BR	ER					
9034R	BR	BR	BR					

Co : Static Load Rating
C1 : Dynamic load rating for 10^6
C2 : Dynamic load rating for 10^8
N : The permissible maximum revolutions per minute
Kr : Size coefficient

BR : Roller bearing (Non-eccentric)
ER : Eccentric roller bearing

Robot Carrier Guide

Carriage (3 rollers)

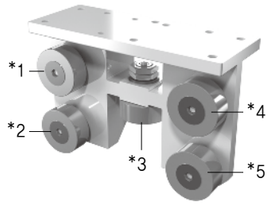


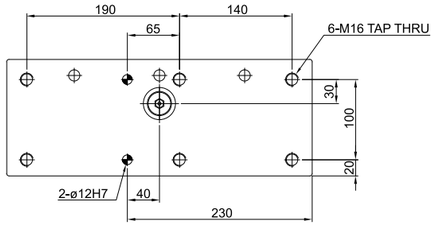
(Unit : mm)

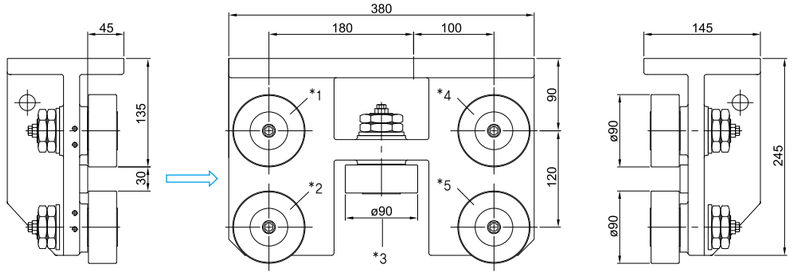
Type	*1	*2	*3	Kr	Co (kN)	C1 (kN)	C2 (kN)	Nmax (min-1)
9031L	BR	ER	ER	2.827	82	43.1	10.8	1800
9032L	BR	ER	BR					
9033L	ER	BR	ER					
9034L	BR	BR	BR					

Carriage (5 rollers)

905xCarriage (5 rollers)





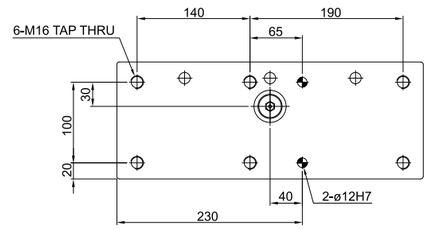


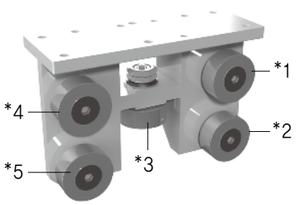
Type	*1	*2	*3	*4	*5	Kr	Co (kN)	C1 (kN)	C2 (kN)	Nmax(min-1)
9053R	BR	BR	ER	BR	ER					
9054R	BR	BR	BR	BR	ER	2.827	82	43.1	10.8	1800
9055R	BR	BR	BR	BR	BR					

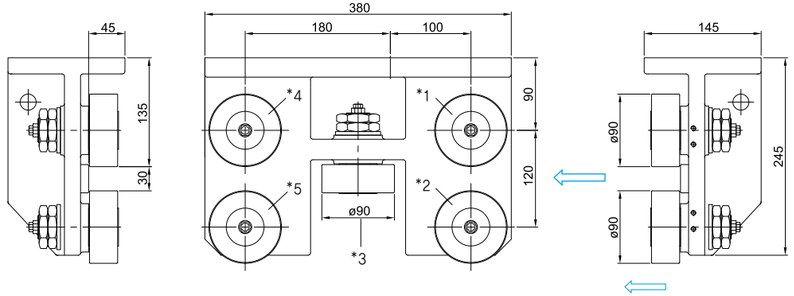
Co : Static Load Rating
C1 : Dynamic load rating for 10^6
C2 : Dynamic load rating for 10^9
N : The permissible maximum revolutions per minute
Kr : Size coefficient

BR : Roller bearing (Non-eccentric)
ER : Eccentric roller bearing

Carriage (5 rollers)



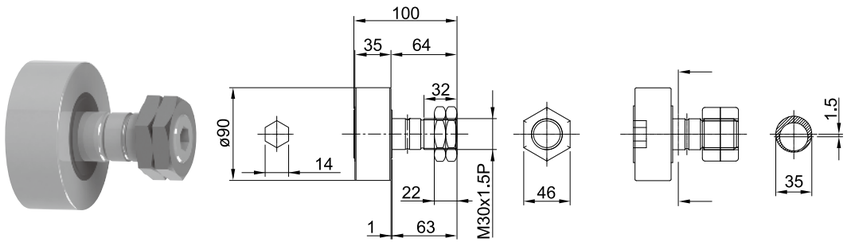




Type	*1	*2	*3	*4	*5	Kr	Co (kN)	C1 (kN)	C2 (kN)	Nmax (min-1)
9053L	BR	BR	ER	BR	ER					
9054L	BR	BR	BR	BR	ER	2.827	82	43.1	10.8	1800
9055L	BR	BR	BR	BR	BR					

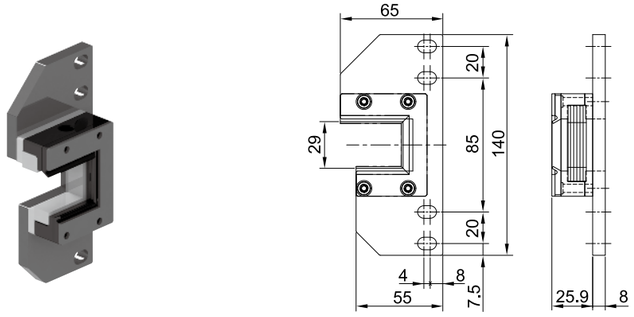
Carriage Option

[Roller bearing]



[90BR] [90ER]

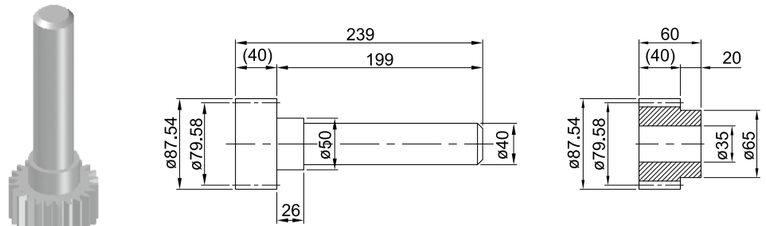
[Wiper & Lubricating device]



Model No.	Direction
90WR	right side
90WL	left side

Carriage Option

[Pinion gear]

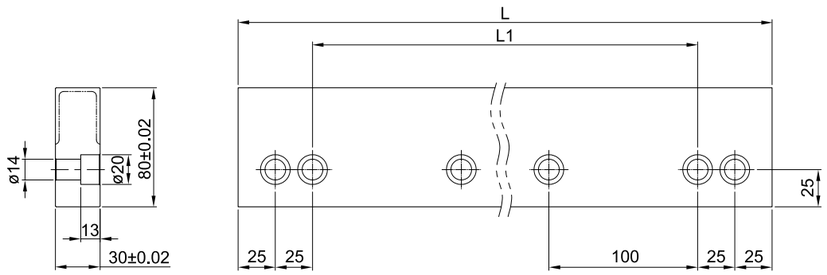


[PA] [PB]

Model No.	Z	M	P	Mat.
PA	20	3.9789	12.5	SM45C
PB	20	3.9789	12.5	SM45C

Z : Number of teeth
M : Module
P : Pitch(mm)
Mat. : Material

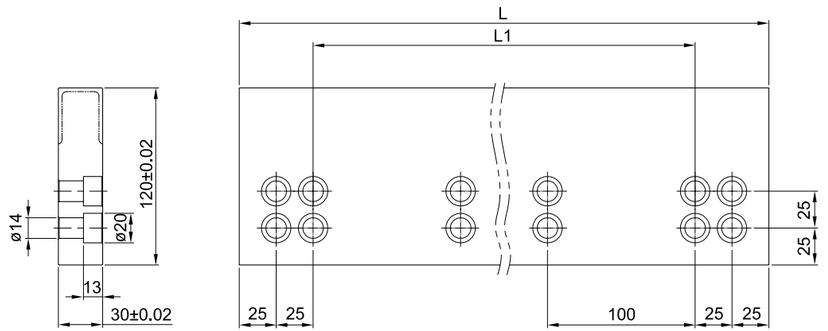
F308 Type



(Unit : mm)

Model No.	L	L1	Mass [kg]
F308-2000	2000	1900	35.6
F308-1000	1000	900	17.8

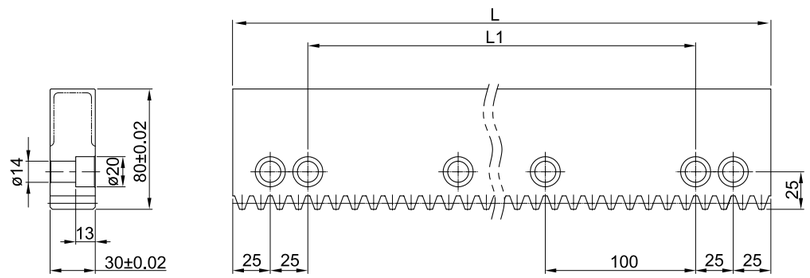
F312 Type



(Unit : mm)

Model No.	L	L1	Mass [kg]
F312-2000	2000	1900	56.1
F312-1000	1000	900	28.1

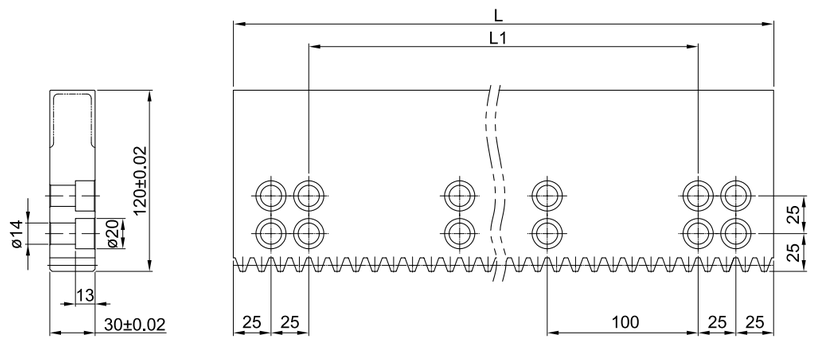
R308Type (Precision gear grinding)



(unit : mm)

Model No.	L	L1	Module	Pitch	Kg
R308-2000	2000	1900	3.979	12.5	34.7
R308-1000	1000	900	3.979	12.5	17.4

R312Type (Precision gear grinding)



(unit : mm)

Model No.	L	L1	Module	Pitch	Kg
R312-2000	2000	1900	3.979	12.5	54.3
R312-1000	1000	900	3.979	12.5	27.2